COMMONWEALTH AGRICULTURAL BUREAUX

THIRTIETH ANNUAL REPORT

OF THE EXECUTIVE COUNCIL

1958-59

INCLUDING NOTES OF PROGRESS
IN THE AGRICULTURAL SCIENCES

LONDON: HER MAJESTY'S STATIONERY OFFICE

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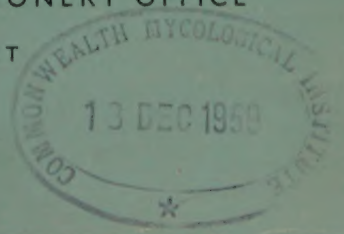

COMMONWEALTH AGRICULTURAL BUREAUX
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Thirtieth Annual Report

of the Executive Council

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1959

CONTENTS

	Page
Preface	3
Report	6
General News	6
Recommendations of the 1955 Review Conference	9
Membership of the Executive Council	11
Liaison Officers	11
Staff Changes	11
Visits Overseas	12
Attendance at Conferences and Committees	12
Visits to Institutes and Bureaux by Distinguished Scientists	13
Publications	14
Summaries of Annual Reports, by Directors	17
Commonwealth Institute of Entomology	17
Commonwealth Mycological Institute	19
Commonwealth Institute of Biological Control	22
Commonwealth Bureaux	23
Notes of Progress in the Agricultural Sciences, by Directors	27
Finance	37
Statement of Accounts:	
Commonwealth Agricultural Bureaux	39
Commonwealth Institute of Entomology	40
Commonwealth Mycological Institute	41
Commonwealth Institute of Biological Control	42
List of Sanctioned Staff	46
List of Liaison Officers	47
Addresses	48

PREFACE

The Imperial Agricultural Research Conference, 1927, stressed (*a*) the need for scientists to be in touch with the progress of research throughout the world in their several branches, and (*b*) the difficulty therein owing to the great output of scientific literature and the diversity of languages in which it is published.

It recommended the governments of the British Commonwealth to establish on a joint co-operative basis eight bureaux to collect, collate and disseminate information on research in eight selected branches of agricultural science, and generally to assist research workers in the Commonwealth and Empire with information relevant to their subjects. Each bureau was to be located at a research institute specialising in its own branch of science so that the bureau officers should be in daily contact with men engaged on research in its own subject. These bureaux were to be financed from a common fund contributed by Commonwealth governments in agreed proportions and controlled by a Council composed of representatives of those governments on an equal footing.

Governments accepted these proposals. In November, 1928, a new type of inter-imperial co-operative agency acceptable to all governments was worked out in detail. On 1st April, 1929, the Executive Council of the Imperial Agricultural Bureaux came into being. The eight bureaux started work in that year. From 1st January, 1948, the name of the organisation was changed to Commonwealth Agricultural Bureaux.

Following the Ottawa Conference of 1932, the work of several inter-imperial agencies was examined and reported upon by the Imperial Committee on Economic Consultation and Co-operation (1933). This committee approved of the bureaux organisation and of its work, and extended the duties of the Council, inter alia, proposing that with effect from 1st October, 1933, they should also be responsible for the supervision and administration and finance of the Imperial Institute of Entomology and of the Imperial Mycological Institute.

It also enunciated certain general principles to be observed in regard to the organisation of agencies for inter-imperial co-operation and consultation, e.g., constitutional equality of participating governments in the appointment of the authority administering the work; the provision of adequate finance for a definite period of years; careful and periodical examination of the work and organisation of the agency at the Commonwealth conferences suitable for the purpose, as without that assurance governments could hardly be expected to provide the adequate continuing finance; and the responsibility of the administering authority to all participating governments. All governments accepted this report.

The British Commonwealth Scientific Conference (1936) conducted the first of these "periodical examinations". It approved both the work and organisation. It recommended the finance necessary until 1941-42 (extended later to cover the war period), its distribution between governments, also the formation of two more bureaux, and certain modifications in practice designed to improve general efficiency. Governments accepted these proposals.

A Review Conference was held in the summer of 1946, just one year after the close of the war. This was the first since 1936 and was only the second "periodical examination" since the recommendations of the Imperial Committee on Economic Consultation and Co-operation in 1933. The Review Conference, 1946, recommended that the Parasite Service should continue to be located at Belleville, Canada, that it should become an individual bureau and that its name should be changed to the Bureau (now Institute) of Biological Control to denote its separate entity. It also decided that information on general husbandry should be provided within the framework of the existing bureaux which, in turn, necessitated the name of the Bureau of Pastures and Forage Crops being altered to Pastures and Field Crops. Both changes of name were made on 1st April, 1947, the opening date of the period to which the recommendations of the conference referred. It recommended the finance necessary until 1951-52 and its distribution between governments. Governments accepted these proposals.

The third periodical examination took place in June and July, 1950. With such a well-established organisation as this had now become, the conference was naturally concerned more with consolidation than with new developments. It did, however, lay stress on the need to continue the service; the mutual advantage of co-operation with international bodies, especially to avoid duplication of work; the possibility of foreign governments being associated with C.A.B.; and the desirability of extending the services of the Institute of Biological Control to foreign countries. It also approved the use of Farnham House for the accommodation of Headquarters and Central Sales, advised the formation of the Consultant Directors into a Scientific Advisory

Committee, approved the handing over of the Potato Collection to the Agricultural Research Council of the United Kingdom and provided funds to set up a new Bureau of Agricultural Economics though, for various reasons, the setting up of this bureau was deferred.

A further Review Conference was held in London in the summer of 1955. A section of the report deals with action on the recommendations of this conference but it is worthwhile recording here the opening recommendation:

> "(1) The Conference is firmly persuaded, as a result of the inspections and discussions which have taken place during its progress, that the Commonwealth Agricultural Bureaux Organisation provides an information service on scientific work in agriculture and forestry throughout the world which is of vital importance for agricultural development and thus for the production of food and the maintenance of living standards; that such a comprehensive service is not provided anywhere else and could not be provided by either national or international organisations so cheaply or so efficiently; and that the cost of the service is very small in relation to the value of agricultural and forestry production in the contributing countries.
>
> "The Conference has endeavoured to frame recommendations which will not only ensure the full and efficient maintenance of existing services and provide for some measure of expansion, but will also leave the door open for further enlargement of the field of activities at a later date."

The institutes and bureaux act as effective clearing houses of information for scientists and research workers in agriculture and forestry throughout the Commonwealth and, increasingly, throughout the world.

To do this they collect information by scanning and indexing as far as possible all journals in their subjects in all languages, by scanning other abstracts, and by keeping in touch with research in progress. They distribute this information by the periodical issue of 15 abstract and three other journals, by the frequent issue of monographs reviewing some particular subject within their field and by various other publications.

Apart from the printed record, the institutes and bureaux serve as intelligence centres in a variety of other ways. They may answer individual enquiries, an activity that ranges from supplying a few references to furnishing a bibliography, a basic library list, or a memorandum of digested information. Several bureaux may co-operate in this, particularly where information marginal to their interest is concerned. They may also supply reprints, photo-reproductions or microfilms of material inaccessible to an enquirer. They also assist research workers by giving information about research centres, by arranging meetings between workers in different parts of the Commonwealth, by arranging the exchange of experimental material between workers, by giving information on post-graduate study, on the sources of supply of apparatus and equipment, and so on. It is stressed that any scientist is free to send enquiries straight to the Director concerned. The institutes have the important additional duty of identification each in its own field.

The Institute of Entomology maintains no collection of its own, as its work is integrated very closely with the British Museum, but the Mycological Institute keeps its own working herbarium which now contains some 76,103 specimens. It also maintains the United Kingdom national collection of type cultures for all fungi except medical fungi, timber rotting fungi and yeasts.

The Institute of Biological Control prepares and maintains a catalogue of the parasites and predators of the insects of the world. Part 5 of Section 2 is the last published. The principal activity of this institute is, however, in the practical field. It consists mainly of the supply of beneficial insects attacking various pests. This requires field survey collections and sometimes mass breeding and the development of special methods of shipment. There are stations in Europe, India, Pakistan, West Indies and the United States. In addition to the supply of parasite material, the institute takes complete charge of biological control projects for governments. The institute also carries out research and educational work.

A brief summary of the work carried out at the institutes and bureaux during the year under review is given on pages 17-27.

The organisations under the administration of the Executive Council are:

The Commonwealth Institute of Entomology

The Commonwealth Mycological Institute

The Commonwealth Institute of Biological Control

The Commonwealth Bureaux of:
- Animal Breeding and Genetics
- Animal Health
- Animal Nutrition
- Dairy Science and Technology
- Forestry
- Helminthology
- Horticulture and Plantation Crops
- Pastures and Field Crops
- Plant Breeding and Genetics
- Soils

A 'liaison' officer appointed by the appropriate

department of each participating country keeps in touch with administrative matters, and in each country for each bureau a scientific officer is nominated as Official Correspondent to be the 'general friend' on scientific matters of that bureau in that country. A few bureaux also nominate Foreign Correspondents who are really the equivalent of Official Correspondents in foreign countries. The Secretary and each director also has an opposite number named in F.A.O. with whom he corresponds directly. The heads of the several institutes at which bureaux are located act as Consultant Directors of the bureaux, thus giving the Council and bureaux the benefit of their wide experience and scientific knowledge. Together they constitute the Scientific Advisory Committee. All other officers are whole-time servants of the Executive Council.

REPORT

At its meeting on the 8th July, 1959, the Executive Council of the Commonwealth Agricultural Bureaux adopted the following report on its 30th year of work—1st April, 1958, to 31st March, 1959.

This is the second financial year of the review period 1957-58 to 1961-62.

GENERAL NEWS

1. *Malaya.* The Federation of Malaya, which became an independent state within the Commonwealth on 31st August, 1957, accepted the invitation of the Executive Council to continue its association with the Commonwealth Agricultural Bureaux.

2. *Council Meetings.* These were held as usual at Africa House and also at Farnham House, at the Forestry Bureau, Oxford, Bureau of Animal Nutrition, Aberdeen, and at the Mycological Institute, Kew. Council met seven times during the year under report besides their conferences with the Scientific Advisory Committee, of which there were two in 1958, and their annual conference with the Directors.

3. *Farnham House.* The advent of main drainage at Farnham Royal has been heralded by noisy operations hardly conducive to the compilation of annual or other reports. The roads are to be widened on either side of Farnham House.

4. *Recognitions and awards.* Professor C. H. Waddington, Consultant Director, Bureau of Animal Breeding and Genetics, received a C.B.E. in the Birthday Honours 1958. In the New Year's Honours 1959, Mr. Ford Robertson, Director, Forestry Bureau, received an O.B.E. and Miss K. Secker, Mycological Institute, an M.B.E.

The University of the Punjab, Lahore, wished to recognise the Rawalpindi Station of the Institute of Biological Control for purposes of research work for the M.Sc. and Ph.D. degree examinations in Entomology. An application for affiliation was accordingly made and accepted by the University.

The Bureau of Helminthology was granted full library facilities by the British Medical Association —an unusual privilege for a non-medical body.

A paper on "The maternal and neonatal weights of some mammalia" by I. Leitch, F. E. Hytten and W. Z. Billewicz was accepted for publication in the Proceedings of the Zoological Society.

A paper by Dr. I. Leitch on "The place of analytical and critical reviews in any growing biological science and the service they may render to research" was accepted for the International Conference on Scientific Information at Washington.

5. *Appreciations.* In his address to the Pakistan Association for the Advancement of Science at Karachi on 7th February, 1959, H.R.H. The Duke of Edinburgh, after briefly recounting the history of the Commonwealth Agricultural Bureaux, declared that it was among "the most practical and scientifically useful co-operative undertakings in the Commonwealth today" and went on to say: "I would like to see the system of the Commonwealth Agricultural Bureaux extended to other sciences and set up in whichever country has the greatest interest in the particular subject".

During the course of the Secretary's tour of Canada in November, 1958, an assistant professor at a Canadian College said in an address that one of the questions he asked students was which book they would choose to keep if the library was reduced to one book and he expected them to answer that it should be the appropriate C.A.B. abstract journal.

From a subscriber in Montana State College, U.S.A.: "Having just laid aside the September, 1958 issue of *The Veterinary Bulletin*, I am once again reminded that for more than a decade I have been dependent upon it in the increasingly difficult task of attempting to keep abreast of the world's veterinary literature. I thoroughly appreciate the time, energy and effort required to carry out accurately, concisely and conscientiously this important responsibility. I would like to take this opportunity to express my gratitude for the wealth of literature, particularly from some of the more unavailable foreign journals, which you bring to my desk each month. You render a much needed service which would be greatly missed in many laboratories and you have acquainted many research workers with new and valuable references to which they might otherwise not have had access."

A widely circulated statement by the American Dairy Science Association included the following paragraph: "The Journal Management Committee of this Association has studied this journal (*Dairy Science Abstracts*) and has reported that it offers the most complete, accurate and valuable abstracting service now available in dairy science".

Evidence of the value of the Centralized Title Service (Forestry Bureau) to Canada came from Ottawa and Toronto. The Forestry Branch at Ottawa furnished interesting particulars of the carefully planned, selective use made of the cards, notably in speedy dissemination of Library Accession Lists, and the building up of author and subject

card catalogues. The Dean of Forestry, Toronto University, said that the Centralized Title Service cards "are becoming the core of our library service, and by some at least are considered more vital than *Forestry Abstracts*".

A well-known helminthologist at the University of Bristol: "I find *Helminthological Abstracts* invaluable and I am often appalled by the number of papers that I would have missed if the Abstracts were not available."

An interview with the Russian geneticist T. D. Lysenko was reported in *Sov. Sci. Bull.* 1958: 5: 1-10. In answer to a suggestion that an obstacle to understanding of the Russian plant work was ignorance of the Russian language, Lysenko is reported to have said: "I do not accept your statement about British ignorance of Soviet work. *Plant Breeding Abstracts* and *Animal Breeding Abstracts* give good coverage of our genetical literature. And when I read Hudson and Richens' book (*The New Genetics in the Soviet Union*) I found that I myself only knew of about half the Russian work cited in their bibliography. Their review is very extensive—I do not agree with their interpretations, but have no time to dispute with them".

A number of comments concerned the value of the Book reviews section in *Plant Breeding Abstracts*. That publishers value them is shown by the cost of the books received for review in volume 28, namely, £222.

Numerous complimentary remarks were received on the annotated bibliographies provided by the Bureau of Soils and on the bureau's services in general:

"I should like to express my thanks for this exceptional service and our appreciation of all the work of the Bureau." (Canada).

"This is indeed a service, and I am most impressed with how much information you have been able to extract from your card-index system." (U.K.).

"May I extend my warmest appreciation for your exceptionally complete reply to my enquiry. In a world of egocentric, grasping people it is unusual courtesies such as yours that make life brighter." (U.S.A.).

6. *Lectures and seminars.* The Secretary, Sir Herbert Howard, gave a number of lectures on his Canadian tour in November, 1958 on the work of the Commonwealth Agricultural Bureaux. At about the same time, Dr. P. S. Hudson, Director, Bureau of Plant Breeding and Genetics, was holding a number of seminars in Canada and the U.S.A. Dr. Hudson also gave a lecture on the "Commonwealth Agricultural Bureaux" to Colonial Agricultural Probationers on 6th August, 1958.

Dr. J. C. F. Hopkins, Director, Mycological Institute, gave lectures by invitation at the Imperial College, London, and addressed the Emanuel School Scientific Society. He also participated in the post-graduate seminar on "Science in the new Commonwealth countries" at the Institute of Commonwealth Studies, University of London.

Dr. J. M. Watson, Director, Bureau of Helminthology, was invited to a press conference given by Messrs. Allen & Hanbury, Limited, at which the commercial production of the first effective vaccine against helminthic diseases was announced.

7. *Foreign co-operation.* A proposal for co-operation in the preparation of abstracts with the U.S.S.R. Academy of Sciences came to nothing owing to the usual difficulties of negotiation behind the Iron Curtain and the fact that the Academy had not issued any journals in the field of Agriculture.

8. *Culture Collection.* The Culture Collection issued a record number of cultures (1,671), a marked feature being a rise of 336 (25 per cent.) in supplies for research and teaching, probably as a result of the modern emphasis on microbiology in education. There was also a 9 per cent. rise in supplies to industry. The record system of the Collection has been improved by the installation of a visual card index system.

9. *Special publications.* Mainly because of the costs and the difficulties in the preparation and publication of the *Parasite Catalogue* in Ottawa, all material in connection with this publication has been shipped to Delemont where the work will now be done, particularly during the winter when project activity is low, and where there are four entomologists to work on it.

A Review of the Biological Control of Insects and Weeds in Australia and Australian New Guinea, by Mr. F. Wilson, C.S.I.R.O., Australia, is being published as the first contribution to the review of biological control in the Commonwealth.

An enquiry conducted amongst users of *Helminthological Abstracts* and a similar enquiry in a circular letter sent to Official Correspondents of the Bureau of Helminthology have revealed an overwhelming majority in favour of changing the issue of *Helminthological Abstracts* from the present system of spreading the production of a volume over several years, so as to include all the literature of a given year in that volume, to a regular quarterly journal embodying literature as it comes to hand. The change will take effect from Vol. 29 (1960) and will make the distribution of the journal much easier.

The Bureau of Horticulture and Plantation Crops has launched the first of a series of Digests aimed to meet the demand for quick information on the

application of recent research findings and field experience to particular problems. Digest 1. *The bulk harvesting of orchard fruit* was issued in December, 1958.

The first draft of an illustrated brochure on the work and growth of the Forestry Bureau was completed in February, 1959.

10. *Information Services.* The discussions which the Executive Council had with the Scientific Advisory Committee ranged over the whole field of bureaux activities. Ways and means were considered of improving and extending the information services already provided.

For details of the many interesting enquiries received during the year, please refer to the summaries of the annual reports for 1958-59 by Directors, paragraphs 30 to 115.

Mention may perhaps be made of five enquiries received by the Bureau of Animal Health one of which was dealt with in conjunction with the Bureau of Plant Breeding and Genetics. These are given below:

"Tembleque" disease of cattle and sheep in Argentina. This is a condition of unknown origin which has caused losses from time to time in certain parts of South America. The symptoms place it in the group of what are commonly called "staggers" diseases. It occurs in animals at pasture and suspicion has been attached to a variety of species of grasses from time to time. The suspected grasses are normally good forage grasses but from time to time under certain conditions of climate and season quite serious disturbances of health occur in livestock grazing on them. Facial eczema of sheep associated with grazing on rye grass pastures has been the subject of intensive study in New Zealand for some years. The work in New Zealand had been mainly of a biochemical nature directed towards the identification of a hypothetical toxin. Quite recently New Zealand workers have demonstrated that the spores of a certain fungus (*Sporidesmium bakeri*), which parasitizes the rye grass, contain a toxin which when fed to experimental animals can produce the symptoms and lesions of the disease. A variety of "staggers" diseases occurs in various parts of the world and the recent New Zealand findings should result in greater attention being paid to the mycological aspects of the problem.

The enquiry came from a British firm with interests in cattle and sheep rearing in Argentina and led to correspondence with an F.A.O. team which was working in Argentina on animal husbandry problems and had become interested in "tembleque".

Lupin poisoning of sheep in Western Australia. Lupins are used in many parts of the world, notably in Eastern Europe, parts of America and Australia as soil improvers on light soils and as fodder for livestock. A type of poisoning caused by alkaloids contained in certain varieties of lupins is well known and can be avoided by growing varieties of lupin which do not contain these alkaloids in dangerous amounts. In addition to this relatively easily controllable form of poisoning another more serious and more chronic type of poisoning associated with liver damage has been increasing in importance in Western Australia in recent years in areas where lupins have been grown and fed to sheep for some years without any problem of poisoning having occurred.

A similar chronic type of poisoning associated with liver damage had been a serious problem in parts of Germany in the second half of the nineteenth century and had been the subject of a number of papers at that time. Like the "staggers" problem mentioned above the onset of poisoning was very irregular and unpredictable and investigators had failed to pinpoint the exact cause. Here again it is possible that mycological studies might be rewarding.

Quarantine regulations against introduction of rabies. The very stringent regulations enforced in the U.K. involve a prolonged period of quarantine of all dogs imported from countries where rabies exists. Some dog owners, anxious to see the period of quarantine greatly reduced, consider that immunization of dogs prior to importation would be a practicable alternative and there has been some agitation to have the regulations altered. The enquiry came from a Member of Parliament who sought information on the regulations in force in other countries especially countries which permit entry of vaccinated dogs either without quarantine or after a short period of quarantine. A study of the position indicated quite clearly the big difference between what was permissible in countries where rabies was already present and those very few countries which were free from this greatly feared disease. The U.K. is one of the relatively small number of countries which are quite free from rabies and where the acceptance of any method which involved even a small element of risk could have very serious consequences.

Methods of immunization of dogs against rabies are available which are very effective and which are of the greatest value in countries where the disease exists. However, in common with all other methods of immunization against infectious diseases whether of man or animals none of the methods used can be relied upon to be 100% effective. There is always a small percentage of failure. Failure may result from some defect in the particular sample of vaccine used, from the fact that the dog was in the incubation stage of the disease at the time of vaccination, or from

some individual idiosyncrasy of the dog. There is also the theoretical consideration that although the vaccine may have successfully immunized the dog, the immunity may wane and could possibly permit the dog to become infected but would mask the symptoms so rendering diagnosis very difficult.

For these reasons the opinion which the bureau expressed indicated that any change in the present regulations would increase the danger of rabies being introduced into the U.K.

Johne's disease in Africa and Asia. Cases of Johne's disease were diagnosed in a herd of cattle in Ghana which had never had contact with European cattle and the bureau was asked what evidence was available to support the commonly expressed view that European cattle had introduced the infection into Asia and Africa. The evidence seems to be largely circumstantial and an examination of the literature available suggested the possibility that the disease may have been present before European cattle were introduced. For example the disease occurs in camels and in yaks in Turkmenistan and there is a considerable incidence of infection in village cattle in some parts of India. It is difficult to get concrete evidence either one way or the other but it is doubtful whether European cattle were responsible in all cases.

Interpretation of Tuberculin tests in cattle. A German veterinary surgeon seemed to have reservations concerning the methods used in his country and sought information on the methods in use in Great Britain. The difficulties arise mainly in connection with the significance to be attached to "non-specific" reactions to the comparative test. Detailed information on the method used in interpretation of official tuberculin tests in the U.K. was supplied by the Chief Veterinary Officer and was forwarded to our enquirer in Germany.

RECOMMENDATIONS OF THE 1955 REVIEW CONFERENCE

11. The following action has been taken on the recommendations of the 1955 Review Conference. Only those recommendations are included here on which some action has been taken during the year under report. At the same time, action continues on the various recommendations mentioned in last year's report, but they are not repeated here unless there has been some fresh action. For economy of space, the recommendations themselves are not printed, but the references are to the recommendation numbers given in paragraph 21 of the 1955 Review Conference Report.

Recommendation (4). The Executive Council have directed the Secretary to attend more meetings and conferences of international bodies to keep in touch with the abstracting world. C.A.B. is now an international member of F.I.D. (Federation Internationale de Documentation).

The Director of the Bureau of Dairy Science and Technology has been appointed a member of a small Working Committee by the International Dairy Federation with a view to the eventual publication of a multilingual dictionary of dairy terminology.

The Assistant Director, Bureau of Helminthology, spent approximately one month of study leave granted by Council and one month of personal leave in carrying out a taxonomic and morphological investigation of certain digenetic flukes under the supervision of Professor J. G. Baer in the University of Neuchatel.

Recommendation (6). Relations between the Commonwealth Institute of Biological Control (C.I.B.C.) and the Commission Internationale pour la Lutte Biologique (C.I.L.B.) had not been entirely satisfactory, but in August, 1958 at Prague, during the 1st International Congress of Insect Pathology and Biological Control, the difficulties were discussed with the representatives of the C.I.L.B., with good results. It was pointed out that the C.I.B.C. was not an organisation specialising in the identification of insects and that its staff could not spend time on this to the detriment of their own official work. It was also pointed out at the time, and subsequently to other C.I.L.B. officials, that the Institute was anxious to co-operate at all times on projects of mutual interest and was willing to undertake work for them on the usual terms when this did not interfere with Commonwealth projects. There was no formal agreement with the C.I.L.B. but relations appear to have improved. In addition, the Institute has been in contact with entomologists and institutes in Russia and Eastern Europe interested in biological control with a view to an exchange of material which will, it is hoped, be of benefit particularly to Canada which is very interested in the possibility of obtaining beneficial insects from inaccessible areas. Very successful work has been done this year in Czechoslovakia and plans have been made to extend this considerably next year.

The Institute has established good relations with the Instituto para el Mejoramiento de la Produccion de Azucar in Mexico for whom, through the financial assistance of the Rockefeller Foundation, arrangements have been made to study the natural enemies of *Aeneolamia* spp. in Mexico (of immediate interest to Trinidad and British Guiana). Contact

has been made with the World Health Organisation on the question of investigating more fully the possibilities of biological control of insects of medical importance.

Work has been undertaken for Mexico on sugar cane borer control, which is of immediate interest to many Commonwealth countries. Plans have been made to carry out work for the U.S.A. next year in both Europe and India, with no detriment to Commonwealth interests.

Although there is no formal association, the Institute is developing close contacts with U.S.A. authorities particularly in those problems which are of mutual interest to Canada and the U.S.A.

Recommendation (7). Nine international organisations were addressed in May, 1958 on the lines of this recommendation.

Recommendation (8)(*a*). The list of Official Correspondents in the Colonial Territories was revised during the year, primarily with a view to naming them by titles rather than by names.

Recommendation (8)(*b*). The official correspondent for Nigeria visited the Bureau of Dairy Science and Technology.

Recommendation (8)(*d*). The Secretary addressed a meeting of Official Correspondents during his Canadian tour in November, 1958.

The Director, Institute of Biological Control, met a number of his Official Correspondents in the West Indies.

The compilation of T.C.26. *Horticulture in the Commonwealth—an outline* was made possible by the information furnished by the Official Correspondents of the Bureau of Horticulture and Plantation Crops.

The Bureau of Pastures and Field Crops consulted its Official Correspondents regarding the coverage and possible ways of improving the journals of the bureau.

Recommendation (9). India held a meeting of Official Correspondents on 20th November, 1958, at which it was disclosed that the Indian Council of Agricultural Research had published a bulletin on C.A.B. which was said to be in great demand.

Recommendation (10). Recent recruits in the Bureaux of Animal Nutrition and Forestry have been of this category.

Recommendation (13). Following the example of the Agricultural Research Council, certain amendments were made to the Supplementation of Pensions Scheme for staff who retired on or after 1st July, 1958.

Recommendation (18). The Executive Council have been concerned about the arrears of indexing for the *Review of Applied Entomology* and steps are being taken to bring them up to date.

Considerable progress was made during the year in reorganising the production of the annual indexes to *Dairy Science Abstracts* and as a result the index to Volume 20 was published in mid-March, 1959, over a month earlier than any previous index.

Recommendation (22). An attempt has been made to make the 1959 edition of the *List of Research Workers* a shorter, more compact and more uniform book of reference. The results will go before the next Review Conference.

Recommendation (24)(*b*) and (*c*). Opinions differ about this recommendation and it is down for discussion at the 1960 Review Conference.

Recommendation (25). This was discussed by the Executive Council with the Scientific Advisory Committee and with the Directors and a paper will be prepared for the 1960 Review Conference.

Recommendation (26). A lease was taken out for the new accommodation of the European Station of the Institute of Biological Control at Delemont. There was too a possibility of better accommodation for the Trinidad Station. Formal leases were being negotiated, at peppercorn rentals, with the Governments of India and Pakistan for the Bangalore and Rawalpindi Stations, respectively.

The possibility of the Bureau of Animal Breeding and Genetics moving to a new building of the Animal Breeding Research Organisation at Edinburgh has been considered.

Recommendation (28). The attention of directors has been drawn to the guiding principles already laid down.

Recommendation (30). The attention of the Director was drawn to this as a result of certain criticisms made to the Secretary on his Canadian tour. The Director has dealt with this.

Recommendation (32). Pending the question of the disposal of the houses at Kew Green, the accommodation has been improved and the rents raised by £414 p.a.

Recommendation (35). (*a*) Materials on the Nematoda continue to be assembled. (*b*) Requests for identifications have been met by the Director with the assistance of outside specialists. (*c*) Not yet begun. (*d*) Bibliographical help was given in a survey of the parasites of sheep in Ceylon and Fiji. All necessary preliminary steps have been taken to equip and furnish a taxonomy laboratory and to appoint a suitably qualified taxonomist so that the taxonomic and identification service in helminthology with special reference to the four aims specified in this recommendation shall be developed on the required scale. It is hoped to complete these arrangements during the forthcoming year.

Recommendation (48). A sample journal in English has been produced in Vienna. Answers to a questionnaire about it have been received from Liaison Officers, Directors and others. It may be that this journal will supply the needs of Agricultural Economists but the whole question will again be discussed at the 1960 Review Conference.

Recommendation (52). This very difficult question is being investigated.

Recommendation (55). Interest and dividends now amount to nearly £10,000 a year.

Recommendation (56). Arrangements were begun to convene the next C.A.B. Review Conference from 24th August to 29th September, 1960. Formal letters were sent to contributing governments to approve of the holding of the Conference in London on the dates proposed; a provisional programme was drawn up and details of the agenda compiled. Some of the agenda items reflected the deliberations of the Executive Council during the year under review, e.g., bases of contributions, general publicity for C.A.B. and its work, and the proposed preparation of Indexes of Agricultural Research by interested governments. Accommodation has been reserved for the Conference at The Church House, Westminster.

MEMBERSHIP OF THE EXECUTIVE COUNCIL

12. Dr. J. G. Malloch, the Member for Canada, succeeded Mr. T. Swaminathan, India, as Chairman and Mr. A. Perera, Ceylon, succeeded Dr. Malloch as Vice-Chairman, with effect from the 173rd meeting of the Executive Council on 24th September, 1958.

Mr. E. J. Drake was appointed Australian Chief Scientific Liaison Officer in London in August, 1958 and succeeded Mr. A. Shavitsky as the representative of Australia on the Executive Council.

Mr. E. D. Andrews, who represented the Union of South Africa on the Executive Council, returned to South Africa on 26th February, 1959, to take up a higher appointment, and Mr. J. F. Brooks was nominated to act as Member of Council till the appointment of a successor to Mr. Andrews.

Mr. S. Krishnamurti was nominated as Member of Council for India in place of Mr. Swaminathan in February, 1959.

Mr. J. E. Sagoe was nominated in September, 1958 as Council member for Ghana in place of Mr. K. B. Asante.

In November, 1958, Mr. J. D. de Silva was nominated to serve on the Executive Council as the first representative of the Federation of Malaya.

LIAISON OFFICERS

13. Dr. P. D. Henning, Assistant Director of Technical Services, was nominated as C.A.B. Liaison for the Union of South Africa in place of Dr. P. W. Vorster, Director of Technical Services.

In December, 1958, the Secretary to the Ministry of Agriculture, Federation of Malaya, was nominated as the first C.A.B. Liaison Officer in Malaya.

Mr. M. O'Doherty succeeded Mr. C. D. Ryan as Liaison Officer for the Republic of Ireland.

STAFF CHANGES

14. *Consultant Directors.* Mr. F. C. Bawden, M.A. (Cantab.), F.R.S., was appointed Consultant Director to the Bureau of Soils on the retirement of Sir William Ogg in September, 1958.

On Professor H. D. Kay's retirement as Director of the National Institute for Research in Dairying at the end of September, 1958, the Consultant Directorship of the Bureau of Dairy Science and Technology was offered to and accepted by Dr. A. T. R. Mattick from 1st October, 1958, for so long as he was Acting Director of the Institute.

The impending retirement of Professor Sir Harry Champion, Imperial Forestry Institute, Oxford, is noted with regret.

Directors and Assistant Directors. Dr. W. J. Hall, C.M.G., M.C., retired from the post of Director of the Institute of Entomology on 13th June, 1958, and was succeeded by Mr. E. O. Pearson. Mr. R. G. Fennah was appointed to the post of Assistant Director and took up his duties on 1st October, 1958, these being discharged in the interim period by Dr. Hall, who then took up a part-time appointment on the staff.

Dr. W. R. Thompson retired as Director, Institute of Biological Control, at the end of June, 1958. Dr. F. J. Simmonds was appointed Director from 1st July, 1958. The Assistant Director, Mr. W. F. Sellers, resigned from 15th June, 1959.

Mr. R. H. Gethin, Assistant Director, Bureau of Animal Breeding and Genetics, also resigned from 31st May, 1959, to take up an appointment under the British Council.

Mr. J. M. Davies was appointed Assistant Director, Bureau of Dairy Science and Technology, from 1st October, 1958.

Dr. J. M. Watson took up his appointment as Director of the Bureau of Helminthology in succession to Professor R. T. Leiper on 1st June, 1958.

On 31st March, 1959, Mr. D. Akenhead, after exactly 30 years in charge of the Bureau of Horticulture and Plantation Crops, handed over to his successor, Mr. G. K. Argles. Mr. Argles had previously been a member of the bureau from 1935 to 1937 and rejoined as Assistant Director in 1950.

VISITS OVERSEAS

15. On his way to the International Conference on Scientific Information at Washington 16th-21st November, 1958, the Secretary, Sir Herbert Howard, visited the headquarters of the Institute of Biological Control in Ottawa and made a tour in Canada in the course of which he gave lectures on the work of the Commonwealth Agricultural Bureaux. Dr. P. S. Hudson, Director, Bureau of Plant Breeding and Genetics, similarly made a tour, before and after the conference, of Canadian and United States Research Stations from 9th October-27th November, 1958. Dr. I. Leitch, Director, Bureau of Animal Nutrition, also attended the conference and presented a paper.

Dr. W. J. Hall visited the Republic of the Sudan from 2nd-18th January, 1959, as a member of the Advisory Committee on Agricultural Research in the Sudan.

Council thought it advisable to draw up a tentative five-year plan for overseas tours to be undertaken by Directors and their staff. They then discussed it with the Scientific Advisory Committee and Directors. While the plan could not allow for all eventualities, it did provide a guide for future tours abroad to cover contributing countries. This overall plan was considered an advance on the previous practice of considering Directors' proposals for tours independently as and when they arose.

ATTENDANCE AT CONFERENCES AND COMMITTEES

16. Mr. E. O. Pearson, Director, Institute of Entomology, and Mr. G. S. Cotterell attended the annual meeting of the Inter-African Phytosanitary Commission held in London from 22nd-26th September, 1958.

Several members of the Institute staff attended the XVth International Zoological Congress in London in July, 1958, at which the late Dr. F. I. van Emden read a paper.

Dr. W. J. Hall continued as Chairman of the Colonial Pesticides Research Committee and as a member of the Colonial Research Council, the Committee for Colonial Agricultural, Animal Health and Forestry Research, the British Standards Institution Technical Committee on Nomenclature of Pesticides, the Advisory Committee on Anti-Locust Research and other Committees or Sub-Committees dealing directly or indirectly with entomological problems overseas.

Mr. E. O. Pearson served on the four committees named above and also on the Scientific Advisory Committee of the Empire Cotton Growing Corporation and the Council of the Royal Entomological Society of London.

Mr. G. J. Kerrich was elected President of the Society for British Entomology and served as Hon. Treasurer of the Systematics Association.

Mr. W. H. Potts, who joined the staff during the year, is Hon. Editor of the Royal Entomological Society of London.

Dr. J. C. F. Hopkins, Director, Mycological Institute, also attended the annual meeting of the Inter-African Phytosanitary Commission in London from 22nd to 26th September, 1958, and participated in the meeting of the International Seed Testing Association of seed pathologists at Cambridge in May. He also joined a working party appointed by the European Plant Protection Organisation in Paris to report on ways of preventing the introduction into the Mediterranean basin of tropical and sub-tropical seed-borne pathogens.

He continued to serve on the Colonial Agricultural Research Committee, Colonial Pesticides Research Committee, British Standards Institution Pesticide Committee, London Advisory Council for Rubber Research and the Medical Mycology sub-committee of the Medical Research Council.

Major H. A. Dade continued to serve on the Stored Products sub-committee of the Colonial Agricultural Research Committee.

Dr. G. C. Ainsworth represented the Mycological Institute at the VIth International Congresses of Tropical Medicine and Malaria in Lisbon, 8th-13th

September, 1958, and read a paper, by invitation, on fungi of the mouth.

Dr. J. M. Watson, Director, Bureau of Helminthology, was a co-rapporteur in the Schistosomiasis Section and was scheduled to read a paper on "Schistosomiasis in the Tigris-Euphrates Valley". As he was unable to go, the Assistant Director, Dr. S. M. Willmott, took his place, attended the Congresses and read the paper.

Sir Herbert Howard with Dr. F. J. Simmonds, Director, Institute of Biological Control, and Dr. L. P. Mesnil of the European Station, attended the 1st International Congress of Insect Pathology and Biological Control in Prague, in August, 1958. Dr. Simmonds and Dr. Mesnil presented papers.

Miss G. R. Ritchie attended the Xth International Congress of Genetics held in Montreal, 20th-27th August, 1958.

Dr. D. Harvey and Miss I. Anderson went by invitation to a meeting of German and Austrian nutrition research workers in Giessen, 23rd-24th March, 1959, to discuss numerical indexing of papers on nutrition.

The Director of the Bureau of Dairy Science and Technology, Mr. E. J. Mann, continued to serve on one of the Organising Committees for the XVth International Dairy Congress to be held in London in June-July, 1959. He was appointed member of a Committee of the International Dairy Federation dealing with dairy terminology the first meeting of which took place in Paris in January, 1959.

Mr. F. C. Ford Robertson, Director, Forestry Bureau, attended in May, 1958 the first meeting of the newly-constituted Sub-committee on British Commonwealth Forest Terminology of the Standing Committee on British Commonwealth Forestry and, in the same month, the Tenth Session at Helsinki of the Joint FAO/IUFRO Bibliographical Committee.

The XVth International Congress of Zoology was held in London, 16th-23rd June, 1958. Dr. Watson and Dr. Willmott were members of the Congress and attended the meetings.

Mr. D. Akenhead, Director, Bureau of Horticulture and Plantation Crops, and Mr. G. K. Argles, Assistant Director, attended the XVth International Horticultural Congress, Nice, 11th-18th April, 1958.

Mr. A. G. G. Hill, Director, Bureau of Pastures and Field Crops, attended meetings held during the year of the organising committees of the VIIIth International Grassland Congress, 1960. He also visited Denmark from 8th-18th June, 1958, with a party of the British Grassland Society.

Dr. Hudson was at the International Symposium on Fodder Plants held in Poznan, Poland, 25th-28th June, 1958.

Mr. G. V. Jacks, Director of the Bureau of Soils, attended the Seventh Technical Meeting of the International Union for the Conservation of Nature and Natural Resources at Athens in September, 1958.

VISITS TO INSTITUTES AND BUREAUX BY DISTINGUISHED SCIENTISTS

17. H.R.H. The Duke of Edinburgh visited the Grassland Research Institute at Hurley on 2nd May, 1958, when the Director, Bureau of Pastures and Field Crops, was given an opportunity of describing the work of the Bureau and showing him some of its publications.

Dr. G. Salt, F.R.S., of Cambridge University spent four months at the Pakistan Station of the Institute of Biological Control carrying out research on the parasites of several pests. In March, 1959 two young entomologists from Mexico came to the West Indian Station for two weeks to gain experience in parasite breeding techniques, etc., in connection with their sugar cane borer control programme.

Dr. H. Epstein, of the Hebrew University, Israel, spent about two months in the Bureau of Animal Breeding and Genetics working on the manuscript of a book on the origin of domestic animals in Africa. He came to the Bureau because he said no other library could provide him with so many books and journals on his subject.

Pressure of work prevented any formal post-graduate documentation course being given by the Forestry Bureau, but individual courses with special emphasis on the use of the Oxford Decimal Classification were arranged for forest department nominees from Northern Rhodesia and Victoria (British Columbia, Canada), and one from the Agricultural Institute, Dublin.

Unusual and very interesting visitors to the Bureau of Animal Health were Professor Bedwyn Jarnipil and Mr. Bazarsad from the Mongolian People's Republic. Both these gentlemen hailed from the veterinary school of the Mongolian National Unversity at Uhlan Bator, Professor Bedwyn Jarnipil being the Vice-Principal of the University. They were possibly the first travellers from Mongolia to have visited the United Kingdom.

To mention all distinguished visitors would make a very lengthy list and the following names are taken rather at random:

Dr. R. C. Anderson, Canada; Professor A. C. Batista, Brazil; Professor N. S. Borkhsenius, U.S.S.R.; Professor S. R. Bose, India; Professor T. W. M. Cameron, Canada; Dr. Clements, Harvard University, U.S.A.; Professor F. D'Amato, Istituto Botanico della Università, Cagliari, Sardinia; Dr. B. d'Oliveira, Portugal; Dr. L. Euzet, France; Dr. O. H. Frankel, C.S.I.R.O., Canberra, Australia; Professor R. Ruggles Gates, U.S.A.; Mr. J. Godber, M.P.; Dr. H. D. Griesau, Land- und forstlicher Forschungsrat E.V., Bad Godesberg, E. Germany; Dr. Abdul Hafiz, Pakistan; Dr. H. Hänsel, Probstdorfer Saatzucht, NO, Hochschule f. Bodenkultur, Wien, Austria; The Rt. Hon. J. Hare, O.B.E., M.P., Minister of Agriculture, Fisheries and Food, United Kingdom; Professor Hitoshi Yamato, Japan; Professor Khaburi, Turkey; Dr. E. Lanzola, High Commissioner for Hygiene and Public Health, Rome, Italy; Professor W. I. Lutjeharms, South Africa; Dr. E. Malinowski, Institute of Genetics, Warsaw; Dr. McMeekan, Ruakura Animal Research Station, Hamilton, New Zealand; Dr. J. Nutman, Kenya; Dr. P. W. Oman, U.S.D.A.; Dr. Premvati, India; Dr. A. T. Pugsley, Agricultural Research Institute, Wagga Wagga, N.S.W., Australia; Professor Saatçioğlu, Istanbul; Sir Foliot Sandford, Registrar, Oxford University; Dr. G. T. Scarascia, Comitato Nazionale per le Ricerche Nucleari, Rome; Mr. N. W. Simmonds, Regional Research Centre, I.C.T.A., Trinidad; Professor S. N. Singh, India; Dr. Harry Spector, Nutrition Branch, Quartermaster Food and Container Institute for the Armed Forces, Chicago, Illinois, U.S.A.; Dr. W. Stefanski, Poland; Dr. H. H. Storey, Kenya; Professor T. Tayss, Israel; Dr. C. C. Velasquez, Phillipines; Sir Samuel Wadham, Australia; Lord Waldegrave; Dr. I. Zojčić, Department of Field Husbandry, Belgrade.

PUBLICATIONS

18. The receipts from sales of publications have always been collected separately by the institutes for their respective publications, and by the Bureau of Animal Nutrition for the journal *Nutrition Abstracts and Reviews*. Central Sales deals with the sales of publications for headquarters, for all the other bureaux and for the Occasional Publications of the Bureau of Animal Nutrition. The four sets of cash have always been shown separately in annual reports.

19. In addition, in reports before 1953-54, the cash receipts of Central Sales were analysed for headquarters and for each bureau. This analysis entailed a considerable amount of work and some thought its value was doubtful as it did not represent the value of sales made during the year. Council therefore decided that, as from the 1st April, 1953, this cash analysis should be discontinued and the receipts of Central Sales during the financial year should be shown as a block total, the figure for 1958-59 being £47,005 as against the 1957-58 figure of £45,018 (see paragraph 20). Council also thought that instead of the cash analysis a record of invoices sent out during the year should be made showing the value of the actual sales made during the year. From paragraph 22 it will be seen that the figure for 1958-59 is £46,551 as against the 1957-58 figure of £44,394.

20. Receipts from sales of publications over the last seven years have been as follows:

	1952–53	1953–54	1954–55	1955–56	1956–57	1957–58	1958–59
	£	£	£	£	£	£	£
Commonwealth Institute of Entomology	9,402	10,210	10,334	11,433	15,582	14,144	14,630
Commonwealth Mycological Institute	5,639	7,367	6,833	6,820	9,438	10,781	11,471
Nutrition Abstracts and Reviews	3,505	7,031	6,972	8,428	9,928	9,582	11,856
The Bureaux	23,932	27,100	30,252	31,041	40,868	45,018	47,005
TOTAL	42,478	51,708	54,391	57,722	75,816	79,525	84,962

NOTE: The prices of journals were raised for the 1953 and 1957 volumes.

Expenditure on production of publications for the bureaux (excluding *Nutrition Abstracts and Reviews* and the Institutes) amounted to £33,182 during the year as against £32,364 for the preceding year. Cash collected during the year was £47,005, thus giving a surplus of £13,823 of revenue over expenditure. This surplus and the rise in revenue of £1,987 results from an increase in subscriptions to the abstract journals (see paragraph 26) and a continuing demand for the back volumes of those journals. It must be repeated that these calculations are for the publications dealt with by Central Sales and do not include the figures for *Nutrition Abstracts and Reviews* nor the publications of the Institutes.

21. *Reprinting Unit.* This unit was established at Farnham House during 1957, reference paragraph 21 of the 29th Annual Report. The unit uses

Xerography (an electrical reproduction process for making paper and metal offset duplicating masters) and offset litho equipment. During the year approximately 10,000 pages of back volumes of journals and other publications have been reprinted.

22. The sales analysis, that is, the analysis of the actual invoices sent out during the year referred to in paragraph 19 above, is shown in the table below. For comparison, figures are given for seven years: one year's cash analysis and six years' sales analysis. It is clear, therefore, that the last six columns are comparable only with each other and are not strictly comparable with the first column of cash analysis. Only the publications dealt with by Central Sales have been shown in this way and earlier figures are intended to show the general trend.

	Cash Analysis	Sales Analysis					
	1952–53	1953–54	1954–55	1955–56	1956–57	1957–58	1958–59
	£	£	£	£	£	£	£
Animal Breeding and Genetics	2,712	2,661	2,934	2,625	3,145	3,706	4,795
Animal Health	4,481	4,161	5,014	5,781	6,963	8,108	8,126
Animal Nutrition	61	83	51	41	628	513	288
Dairy Science and Technology	1,764	2,101	2,388	2,727	5,107	3,972	5,431
Forestry	2,290	2,442	2,939	3,274	5,180	5,087	5,913
Helminthology	1,203	1,540	1,621	1,866	2,266	3,174	2,765
Horticulture and Plantation Crops	2,720	3,729	3,343	3,541	4,686	5,036	5,138
Pastures and Field Crops	3,155	3,033	4,083	3,916	4,787	4,830	4,573
Plant Breeding and Genetics	2,450	2,911	2,929	3,718	4,320	4,242	4,224
Soils	2,908	2,822	3,648	4,005	4,683	5,468	5,183
Headquarters	188	184	106	88	329	258	115
TOTAL	23,932	25,667	29,056	31,582	42,094	44,394	46,551

The small increases and decreases from year to year in the sales of publications of the individual bureaux are largely due to the incidence of the issue of occasional publications. If a bureau issues two or three occasional publications during one year and none the following year, there will be a slight decrease in sales unless there has been a very large increase in subscriptions to its abstract journal.

23. The above table relates to sales and takes no account of copies distributed under the quota system or free. Under the quota system copies of the 1958 volumes of the journals to the value of £8,742 were sent to countries of the Commonwealth and other contributing countries. In addition, journals to the value of £2,458 were sent free and as exchange to Commonwealth countries and to the value of £3,317 to foreign countries.

The total value of copies distributed under the quota, free and exchange was £14,517.

Corresponding figures for 1957 were quota, £8,576, free and exchange to Commonwealth countries, £2,279 and to foreign countries £3,273; total value, £14,128.

In paragraph 20 it is said that receipts from sales during the year showed an excess over the direct costs of printing, distribution and paper, but if the very great value of these various free copies is added to the receipts, the total comes to far more than the direct cost of production.

24. In addition, a further 187 volumes of *Agricultural and Horticultural Engineering Abstracts* were distributed under the quota system by arrangement with the National Institute of Agricultural Engineering.

25. The numbers on the mailing lists for the 1958 volumes of all the journals were as follows:

	Volumes supplied under quota system	Other volumes supplied free	Subscriptions	Total
British Commonwealth, the Republic of Ireland and the Republic of the Sudan	2,652	744	6,428	9,824
Other countries	—	985	10,813	11,798
TOTAL	2,652	1,729	17,241	21,622

26. The subscriptions to the *Bulletin of Entomological Research* and the fourteen abstract journals only, detailed in paragraph 28, increased in number during the year from 16,132 to 16,408. This is analysed in the following table:

Agency	1957	1958	Increase or Decrease		Percentage Increase
			Plus	Minus	
Institute of Entomology (3 journals)	3,430	3,310	—	120	Decrease
Mycological Institute (1 journal)	1,449	1,496	47	—	3·2
Nutrition Abstracts and Reviews (1 journal)	1,699	1,709	10	—	0·6
Bureaux (10 journals only)	9,554	9,893	339	—	3·5
TOTALS	16,132	16,408	276		1·7

The decrease of 120 in subscriptions to the three journals of the Institute of Entomology was made up as follows:

Bulletin of Entomological Research, 28, *Review of Applied Entomology Series A*, 60 and *Series B*, 34. These decreases largely occurred in subscriptions from foreign countries, especially the United States and China and an enquiry is now being made to ascertain the reason for this decline.

27. Action taken to increase the sales of journals and occasional publications was as follows:

(i) Central Sales now distribute twice a year a *Publications List of the Commonwealth Agricultural Bureaux* to selected addresses. Some 5,000 of the April, 1958 list were despatched and 6,000 of the October, 1958 list. Leaflets describing new Occasional publications and cyclostyled forms showing recent publications were inserted in the journals in considerable numbers. Interested people were given specimen copies of journals and, in some cases, extra copies of certain parts of journals were printed to be circulated to potential purchasers.

(ii) Publications were shown in book exhibitions organised by scientific organisations or associations of booksellers. During the year C.A.B. publications were displayed at book exhibitions in London, York, New York, Leipzig, Tokyo, Osaka and Peking.

(iii) C.A.B. publications were also brought to the notice of scientists and the public generally by advertisements either paid for or exchanged with other scientific journals.

(iv) The annual report is sold and is also widely distributed free, thus permitting many persons to acquaint themselves with the work of C.A.B. if they so desire.

28. During 1958 the following volumes of the *Bulletin of Entomological Research* and the fourteen abstract journals were issued:

Bulletin of Entomological Research, Vol. 49
Review of Applied Entomology, Series A, Vol. 46
Review of Applied Entomology, Series B, Vol. 46
Review of Applied Mycology, Vol. 37
Nutrition Abstracts and Reviews, Vol. 28
Animal Breeding Abstracts, Vol. 26
Veterinary Bulletin, Vol. 28
Dairy Science Abstracts, Vol. 20
Forestry Abstracts, Vol. 19
Helminthological Abstracts (see next paragraph)
Horticultural Abstracts, Vol. 28
Herbage Abstracts, Vol. 28
Field Crop Abstracts, Vol. 11
Plant Breeding Abstracts, Vol. 28
Soils and Fertilizers, Vol. 21

With the exception of *Helminthological Abstracts*, the publication year of all the above journals is the calendar year and the first part or parts of the 1959 volumes were issued by the 31st March, 1959, the end of the year under review. With *Helminthological Abstracts*, the scheme is to bring the literature of each year into a single volume. The first part of Volume 27 (1958) was issued during the year. The later parts containing titles and abstracts of papers published in relatively inaccessible journals will be issued as soon as possible. Arrangements are now being made so that the publication year of *Helminthological Abstracts* will also be the calendar year.

29. Other periodical publications issued during the year were:

Distribution Maps of Insect Pests, Nos. 85-96	*Entomology*
Distribution Maps of Plant Diseases, Nos. 353-363 and Index for 1958	*Mycology*
Commonwealth Phytopathological News, Vol. 4, Parts 2-4, Vol. 5, Part 1	*Mycology*
Bibliography of Systematic Mycology for 1957	*Mycology*

Review of Medical and Veterinary Mycology Vol. 3, Parts 2-5	*Mycology*
Catalogue of the Culture Collection (2nd Edition), Supplements 3 and 4	*Mycology*
Index Veterinarius, Vol. 25 (1957), Parts 3 and 4, Vol. 26 (1958), Parts 1 and 2	*Animal Health*
Veterinary Reviews and Annotations, Vol. 4	*Animal Health*

The following occasional publications were issued during the year:

The Insect Pests of Cotton in Tropical Africa by E. O. Pearson assisted by R. C. Maxwell Darling	*Entomology*
An Annotated List of Seed-Borne Diseases by Mary Noble, J. de Tempe and Paul Neergaard	*Mycology*
Investigations on Alternaria Leaf-Spot of Flue-cured Tobacco in Nyasaland by B. E. J. Wheeler	*Mycology*
Phytopathological Paper No. 3	*Mycology*
Parasite Catalogue, Section 2, Part 5	*Biological Control*
Dairy Cattle Breeding in the Tropics by P. Mahadevan	*Animal Breeding and Genetics*
Pig Carcass Evaluation by G. Harrington	*Animal Breeding and Genetics*
Bird Hybrids. A Check-List with Bibliography by Annie P. Gray	*Animal Breeding and Genetics*
Abstract Bibliography of Fruit Breeding and Genetics to 1955: *Rubus* and *Ribes*—A Survey by R. L. Knight and Elizabeth Keep	*Horticulture and Plantation Crops*
Horticulture in the British Commonwealth—An Outline by D. Akenhead	*Horticulture and Plantation Crops*
The Bulk Harvesting of Orchard Fruit by G. E. Tidbury	*Horticulture and Plantation Crops*

SUMMARIES OF THE ANNUAL REPORTS FOR 1958-59, BY DIRECTORS

COMMONWEALTH INSTITUTE OF ENTOMOLOGY

30. Dr. W. J. Hall retired in June, 1958 from the post of Director, which he had held since 1946, and was succeeded by Mr. E. O. Pearson. Mr. R. G. Fennah, who has had long and varied experience in the West Indies and is an authority on the Fulgoroidea, was appointed to the post of Assistant Director and took up his duties in October, 1958. Capt. H. S. Bushell retired in January, 1959, after 39 years' service, and was succeeded as Assistant Editor of the *Review of Applied Entomology* by Mr. R. F. Avery, who joined the staff in 1936. A severe loss was inflicted in September, 1958 by the sudden death of Dr. F. I. van Emden, who had been on the staff since 1937 and was a world authority on the Diptera. Mr. N. C. E. Miller, who specialised on the Hemiptera, retired in August, 1958. The Institute has been fortunate in obtaining the part-time services of both Dr. Hall and Capt. Bushell for special duties, and Mr. W. H. Potts, formerly Chief Entomologist of the East African Tsetse and Trypanosomiasis Research and Reclamation Organisation, has been appointed on a similar basis to assist in the editing of the *Review*.

These extensive changes, which have been accompanied by a shortage of abstractors and by difficulty in replacing losses of these and other staff, have necessitated considerable reorganisation, but it has been possible to maintain the Institute's services without interruption and it is hoped that the measures taken will bear fruit in the coming year and ease some of the strain that has been felt.

31. The number of specimens received for identification during the year was approximately 54,500, little less than that of the previous year (55,500). They arrived in 555 (603) consignments sent in by 235 (277) different correspondents, of whom 84 (91) were in Africa, 17 (21) in America, 46 (51) in Asia, 20 (22) in Australasia and Oceania, and 69 (92) in Europe. Four hundred and sixty-six lists of identifications were sent out (415) comprising 6,948 (7,089) names, and the total of species identified was made up from the following sources: Africa 3,889 (2,680); America 119 (280); Asia 1,322 (2,210); Australasia and Oceania 1,040 (1,338); and Europe 578 (581). Identifications, as hitherto, were made for almost every unit in the Commonwealth. The bulk of the material was, as usual, returned to the senders and 8,885 (14,875) specimens have been presented to the British Museum, including the types of 202 (132) species, and specimens of a further 196 (463) species not previously represented in the National Collection.

32. Thirty-three papers presenting the results of taxonomic and other research were published by members of the staff in scientific journals, comprising in all 708 printed pages, and one monograph of 355 pages.

33. Mr. D. MacFarlane, Acarologist of the Institute staff, visited Reading in September, 1958, as a member of a team of specialists responsible for giving a short course in Acarology under the auspices of the National Agricultural Advisory Service of the Ministry of Agriculture, Fisheries and Food.

34. The *Review of Applied Entomology*, Series A and B, Vol. 46 (1958) totalled 732 pages (exclusive of indexes) and contained 1,453 abstracts and titles, the corresponding figures for 1957 being 720 and 1,466. The indexes to Series A, Vol. 43 and Series B, Vol. 44 were issued during the year. Special arrangements have been put in train which are designed to overcome the arrears of indexing of the *Review* by the autumn of 1960.

The *Bulletin of Entomological Research* Vol. 49 (1958) comprised 63 papers, of which 38 were contributed from entomologists working overseas, totalling 802 pages and 29 plates, the four parts being issued in March, June, September and December, 1958 and the Index (24 pages) in March, 1959.

Twelve issues (Nos. 85-96) were made in the series of *Distribution Maps of Insect Pests*, six in each of June and December, 1958.

The Insect Pests of Cotton in Tropical Africa (pp. x + 355, 8 col. plates, 25 pp. references, price 40/-) by E. O. Pearson, assisted by R. C. Maxwell Darling, was issued as an Occasional Publication in November, 1958.

35. There was a fall in the number of subscribers to journals, the figures (with those of 1957 in brackets) being: *Review of Applied Entomology* Series A, 1,331 (1,391); Series B, 1,039 (1,073); *Bulletin of Entomological Research*, 940 (966). These reflect a net reduction in the number of foreign subscribers, which has fluctuated rather widely in recent years. Sales of back numbers of the *Review*, at £2,146, were more than double those of 1957 and suggest an increase in the numbers of our more stable clientele. The number of subscribers to the *Distribution Maps of Insect Pests* showed a slight increase. A total of 1,150 copies of Occasional Publications were sold, 774 being of J. R. Busvine's *Critical Review of the Techniques for Testing Insecticides*, which has proved, as was expected, a good seller.

36. The proportion of the receipts from sales of the *Zoological Record*, part *Insecta*, received by the Institute under agreement with the Zoological Society of London, amounted to £676 (£810), to which must be added the Society's annual contribution of £400 towards the cost of production. Vol. 93 (literature of 1956), comprising 536 pages and providing a guide to the subject matter and a complete record of the systematic content of 3,444 entomological papers, was published in July, 1958. Vol. 94 (literature of 1957) is in the press.

37. The total net cash receipts from all sales of publications, including back volumes, amounted to £14,630 as compared with £14,144 in the previous year. The increase is accounted for mainly by sales of back numbers of journals and of Occasional Publications.

38. Library accessions during the year numbered 230 volumes and 1,018 pamphlets, making a total of 14,243 volumes and 47,063 pamphlets now in the library. Parts of 721 serial publications were also received. The author catalogue is up-to-date for monographs, and further progress has been made in dealing with arrears of cataloguing of separates. The proportion of the bound volumes in the library of which the entomological contents have been catalogued on cards by authors is 70·7 per cent. The subject index to monographs, comprising 2,248 cards, is up-to-date, and so is the sheaf catalogue of serial and official publications. During the year, the Librarian revised the list of holdings for the new edition of the *World List of Scientific Periodicals* and for the proposed *British Union Catalogue of Current Periodicals*. The library was in daily use by both staff and visitors, and 1,486 loans were made during the year. As usual, various subject and bibliographical enquiries from government departments, universities, research organisations, commercial firms and individual enquirers were received and dealt with. Microfilms and photocopies of 81 articles and extracts were obtained for enquirers in 10 Commonwealth and 7 foreign countries. Surplus publications were distributed to the various Bureaux and other institutions, and grateful thanks are due to the numerous individuals and organisations that donated publications to the library.

39. The numerous enquiries which have been dealt with during the year have by no means been confined to requests for the identification of insects. Their subjects have ranged from damage to polythene-sheathed electric cables in the Sudan and Libya, skeins of wool in the United Kingdom, oranges in South Africa and young cacao in Malaya (received through the Commonwealth Mycological Institute), through conventional requests for data on geographical distribution, hosts and habits of a variety of insects and mites, to more recondite matters, such as the likely identity of a pest of *Sesamum* mentioned in a Babylonian cuneiform text, and to appeals for bibliographic assistance, occasionally on a comprehensive scale, or for the

solution of nomenclatorial conundrums involving reference to the International Commission on Zoological Nomenclature.

40. The Institute continued to collaborate with the World Reporting Service of the Food and Agriculture Organisation, and with the Inter-African Phytosanitary Commission, for which extensive compilation and checking of lists of insect pests has been in progress.

41. Mr. E. S. Brown, of the Colonial Pool of Entomologists, continued his secondment to the Foreign Office, with his headquarters in Beirut, for study of the soun pest, *Eurygaster integriceps* Put., and carried out field work in Iran, Pakistan and Turkey. Arrangements have been made on his behalf with the Tropical Products Institute to collaborate in studies of the physiological condition of the overwintering bug. Mr. C. R. Wallace has continued his study of the insect pests in the Island of St. Helena and reports the establishment of *Anaphoidea nitens* Gir., the parasite imported from South Africa for the control of the eucalyptus weevil, *Gonipterus scutellatus* Gylh., and good results in the chemical control of the Mediterranean fruit fly, *Ceratitis capitata* (Wied.), and of several other crop pests. Dr. I. W. B. Nye spent several months at the Institute in further study of material collected during his survey of the pests of tropical cereal crops in East Africa, and in writing his report, and left in March for a short assignment to the Seychelle Islands, where he is to assess the results of control measures taken against *Melittomma insulare* Fairm. on the basis of Mr. E. S. Brown's earlier work on this pest of coconuts, and advise on further measures.

42. During the year the Colonial Termite Research Unit identified 92 species of termites, received in 381 samples. These originated, as usual, from many different countries, which included Austria, Belgian Congo, East Africa, Federation of Rhodesia and Nyasaland, Ghana, India, Nigeria, Saudi Arabia, Singapore and Turkey.

Members of the Unit visited Nigeria, Nyasaland, Kenya, the West Indies and British Honduras. Six thousand eight hundred specimens were donated to the British Museum (Natural History) after identification, including the types of 11 newly-described species. Reference material has been exchanged with specialists in other countries.

Publications have dealt with the termites of the Belgian Congo and the Solomon Islands, the genus *Amitermes* in Africa, new species of Kalotermitidae, and termite biology.

Economic queries have been principally concerned with termite-proofing such products as electric cables, ply-woods, cork and other insulating materials. Other matters have included the protection of low-cost housing in North Africa, the Middle East and Tropical Africa. Lectures were given in the Tropical Department of the Architectural Association's School of Architecture.

43. It is a pleasure to record thanks to Sir Gavin de Beer, the Director of the Natural History Museum, and to Dr. W. E. China, the Keeper of Entomology, for the facilities accorded to the members of the staff of the Institute who work in the Museum and for the continued close and friendly co-operation of the staff of the Department of Entomology.

COMMONWEALTH MYCOLOGICAL INSTITUTE

44. *General.* There have been rather more than the usual number of visitors using the herbarium and library: ten have worked in the Herbarium for periods ranging from over a week to 3 months. They have come from Australia (2 months), Canada (3 weeks), France (6 weeks), India (10 days), Nigeria (5 weeks, 1 month), Papua and New Guinea (3 months). Dr. G. M. Wickens from Uganda spent 5 months writing a new *Phytopathological Paper* on bacterial blight of cotton and Mr. R. W. Rayner commenced a period of 6 months analysing and writing up his research results on coffee in Kenya.

An annual Students' Day has been inaugurated with visits from the Imperial College and the Women's College of Pharmacy, London. Parties from societies and institutions have also been invited and visits paid by members of the Institute of Biology, British Mycological Society, Société mycologique de France, Glasshouse Crops Research Institute, and Emanuel School.

45. The Executive Council of C.A.B. held their November meeting at the Institute.

By invitation, the Director gave lectures at Imperial College, London, and to Emanuel School Scientific Society. He also again participated in the post-graduate seminar on "Science in the New Commonwealth Countries" at the Institute of Commonwealth Studies, University of London.

46. The grounds of the New Building have now been 'tamed' and laid down mainly to lawns.

The rooms in Nos. 59 and 61 Kew Green previously used as offices have been converted to flats and let. The first floor of No. 61 and the top floor of No. 59 were redecorated and amenities improved,

and have been re-let at increased rents. The total increase in revenue from these sources is £414 per annum.

47. *Library.* A large increase in the number of journals received has handicapped necessary work on the reprint collection, which has made little progress since last year. With the kind help of the lending library of D.S.I.R. 37 new Russian and mid-European journals have been added to the library and a number of books have been donated from the same countries. A further 87 book accessions were made and 1,647 reprints received and indexed. Loans amounted to 242. 272 volumes of journals and 70 books have been bound.

48. *The Review of Applied Mycology*, Volume 37, has followed the policy introduced last year and has published 2,914 abstracts on 768 pages as compared with 2,803 on 928 pages in Volume 36. This has been accomplished by introducing directory notices for short or less important papers whilst retaining full treatment for those of greater import, and at the same time employing wherever it is unambiguous internationally recognized abbreviations. This makes for harder reading but, in view of the ever increasing literature and rising cost of printing, appears to be the only alternative to reducing the 'cover' or raising the journal price.

49. *The Review of Medical and Veterinary Mycology.* As a result of the distribution of about 20,000 leaflets, other methods of publicity, and personal contacts, this journal is becoming better known. There has been an increase of 113 new subscribers from 39 countries during the year and many back numbers and complete sets have been sold. The new quarterly issue appears to meet the needs of readers.

50. *Index of Fungi.* A number of little-known sources of publication of new species has been uncovered with a consequent increase in the number of entries, which this year amounts to some 2,400 compared with 1,200 ten years ago. Entries of names omitted from Petrak's lists now number nearly 2,000, and the first supplement to the lists is in preparation.

51. *Identification Service.* 3,798 specimens, bringing the total accessions in the herbarium to 76,103, were received during the year from the following Commonwealth countries: Australia, Bermuda, Borneo, British Guiana, Canada, Ceylon, Cyprus, Ghana (63), Hong Kong, India (130), Jamaica, Kenya (98), Malaya (42), Mauritius (34), New Zealand, Nigeria, Northern Rhodesia (95), Nyasaland, Pakistan (60), Palestine, Papua and New Guinea (80), Singapore, South Africa, Southern Rhodesia, Tanganyika, Trinidad, Uganda, United Kingdom and West Africa.

Identifications were also made of specimens from Argentina, Belgian Congo, Hawaii, Iraq, Iran, Italy, Republic of the Sudan, Turkey, and Venezuela.

52. Dr. Ellis continued his studies of the Hyphomycetes with special reference to *Clasterosporium* and allied genera, especially *Stigmina*, a key to some 30 species of which is now in the press. Other genera dealt with in this *Mycological Paper* are *Brachysporiella*, *Endophragmia*, and *Bactrodesmium*. He is examining fungi allied to '*Sporidesmium bakeri*', which is of considerable importance in New Zealand and said to be the cause of facial eczema in sheep. He also gave assistance to Dr. Sharif of Iran in the preparation of a doctorate thesis on graminicolous species of the important genus *Helminthosporium*.

Mr. Deighton continued his studies of the rusts and *Cercosporae*, and of West African fungi in general. The first of a series of *Mycological Papers* on *Cercospora* is in the press. He has published papers on Meliolineae in *Sydowia* and collaborated with Dr. T. W. Tinsley in a list of virus diseases of plants in Ghana and Sierra Leone: he also continues to compile and edit the *Index of Fungi*.

Miss Waterhouse has received 128 specimens for identification, has extended her work on the Phycomycetes, and has published a second paper on the genus *Pythiomorpha* in *Trans. Brit. mycol. Soc.* She has given assistance in the compilation of the *Annotated List of Seed-borne Diseases*, and in the revision of the *List of Common British Plant Diseases*, which is being published by the British Mycological Society. She continues to compile the *Bibliography of Systematic Mycology*.

Mr. Booth has studied further life histories of the Pyrenomycetes and Sphaeropsidales, a revision of *Nectria* species being in the press. He has also completed a revision of the C.M.I. publication *Common Names of Tropical Plant Diseases*, originally compiled by the late Dr. Bisby.

53. *Culture Collection.* The total in the collection now numbers 2,524 (2,296 in 1957). New accessions numbered 251 and 19 were discarded. 1,671 cultures were issued: 763 to industry (697), 742 to research and educational establishments (482), and 166 free or in exchange (156). Sales amounted to £718 (£588). There was an increase of 25 per cent. in issues for teaching and research and of 9 per cent. in industrial cultures. In all, the total distributed constitutes a record and indicates that more use is being made of the collection.

The records have been simplified by the introduction of a modern visual card index system.

There has been a further increase in requests for information, particularly on proofing of materials against mould contamination, and moulding of foodstuffs. Among the more important enquiries were those from Gillette Razors on cold sterilization of leather, cloth, and paper; St. Ann's Hospital on

the association of dry rot with asthma; the Atomic Energy Research Establishment on the control of relative humidity in "damp chambers"; the British Leather Manufacturers' Research Association on the identity of fungi affecting leather; the Baking Industries Research Association on the occurrence of *Sporendonema sebi* on packaged cakes; H. J. Bunker on moulding of packaged table jellies; and de Havilland's on mould-proofing of aircraft propellers.

Co-operation has been continued with overseas pathologists in the maintenance and supply of tropical plant pathogens and with school teachers in extending their practical teaching and demonstrations of fungi.

Mr. Elphick joined the staff in June and took up the work previously done by Dr. Brown on *Penicillium* and *Aspergillus*. He is also working on a paper on *Sporotrichum*.

54. *Inter-African Phytosanitary Commission.* Mr. Altson completed his survey of dangerous bacterial plant pathogens and their hosts so far unrecorded in Africa, with bibliographical references suitable for conversion to a card index, by two further lists which were issued as I.A.P.S.C. documents. He is engaged on a similar survey of plant viruses, two lists of which have been completed and one issued. He also prepared tabulated lists of the distribution on 25 crop plants of diseases known to occur in Africa and recorded from the islands of the Indian Ocean adjacent to Africa south of the Sahara.

The Director attended the meeting of the Commission held in London from 22nd to 26th September and has spent considerable time in advising the Scientific Secretary on day to day matters affecting the Commission. The attention of the Scientific Secretary was drawn to the danger of importing rice seed from countries where hoja blanca virus disease occurred and tea seed from areas infected by blister blight.

55. *Pool of Plant Pathologists.* Mr. Holliday obtained varieties of *Piper nigrum* resistant to *Phytophthora* foot-rot during his tour of India and Indonesia and is growing these in Sarawak. He has shown that the Sarawak variety is highly susceptible. He has commenced field control trials and is investigating the relationship of nematodes to the incidence of the fungus. He is also investigating what appears to be an unrecorded virus disease of pepper which destroyed some of his experimental plots.

Dr. Wheeler has made headway in his investigations of the control of withertip (*Gloeosporium limetticola*) of limes in Zanzibar, having obtained encouraging results with phenyl mercury nitrate eradicant sprays. He is studying the etiology of the disease and has obtained beneficial results from nitrogenous fertilizers in reducing the disease. It is as yet too early to assess the value of his results.

56. *World Reporting Service on Plant Diseases.* The Institute continued to collaborate with F.A.O.

57. *Publications.* Sales of publications and cultures amounted to £12,185, an increase of £761 on 1957. Subscribers to the *Review of Applied Mycology* increased from 1,449 to 1,496 and total distribution from 1,756 to 1,811. Sales, however, realized £6,852 (back numbers £1,756) compared with £7,047 (£1,961) the previous year, the latter figure being enhanced by the forward payment of many subscriptions in 1957-8, which were therefore lost to the current year.

The new quarterly issue of the *Review of Medical and Veterinary Mycology* has been a success, 113 new subscribers, from 39 countries, including a good number of veterinary departments of the Commonwealth, being registered during the year. Sales increased by £535, from £634 to £1,169. Thus, as a result of publicity and reorganisation, sales have increased from £367 to the present figure in two years.

The assistance of several outside abstractors is gratefully acknowledged, especially that of Professor Juan E. Mackinnon of the University of Montevideo. The *Review* has sustained a grievous loss in the death of Dr. J. T. Duncan, who gave invaluable help in its production from its inception in 1943.

No *Mycological Papers* were issued during the year owing to pressure of work in other directions: sales, however, dropped only from £627 to £555.

Parts 16 and 17 of the *Index of Fungi*, compiled by Mr. Deighton, were published, sales increasing from £437 to £545. The *Bibliography of Systematic Mycology for* 1957 was again prepared by Miss Waterhouse and published, and the report on Dr. Wheeler's investigations of *Alternaria* leaf spot of tobacco in Nyasaland was also issued as an occasional paper, prepared for photo-offset reproduction at the Institute.

Phytopathological Papers are becoming established as a series, 60 standing orders having been registered. *Paper* No. 3 (Club root disease of Crucifers caused by *Plasmodiophora brassicae* by J. Colhoun) was issued; sales of the series amounted to £181 compared with £125 last year.

11 new and 13 revisions of *Distribution Maps of Plant Diseases* were issued, sales totalling £320 (£214 last year). Most of this increase resulted from the distribution of an advertising leaflet and order form prepared at the Institute.

58. With the assistance of Central Sales and their new xerographic reproduction plant much headway was made in reprinting the *Review of Applied Mycology* and *Mycological Papers*, 45 parts of the former and 6 of the latter being completed. Further reprinting of the *Review of Applied Mycology* is planned for 1959 and it is hoped to have 24 complete sets by the end of the year. There are now 24 complete sets of *Mycological Papers* available for distribution, and it is anticipated that 100 will be ready by the end of the year.

59. *Information Service.* Orders have been supplied as follows:

Microfilms	98 (5,500 pages)
Photocopies	42 (1,200 pages)
Enlargements	750 prints

Sales amounted to £101 (£112 last year).

In addition over 500 microfilms have been added to the library bringing the total to 2,505.

242 books and reprints were sent on loan.

60. *Changes in Staff.* Nil.

COMMONWEALTH INSTITUTE OF BIOLOGICAL CONTROL

61. Dr. W. R. Thompson retired and Dr. F. J. Simmonds succeeded as Director from the end of June, 1958. The headquarters of the Commonwealth Institute of Biological Control have remained at Ottawa during the year. The Director has, however, been for part of the time at the West Indian Station (August-September, 1958 and January, 1959) and California Station (December, 1958), and also, before appointment as Director, at the European Station (May, 1958).

62. Mr. W. F. Sellers, Assistant Director, in charge of the Californian Station, resigned in June, 1959, with leave preparatory to retirement commencing on 16th March, 1959. Dr. D. C. Lloyd will now be entomologist-in-charge of this station, where work has continued on natural enemies of scale insects and mealy bugs.

The European Station has carried out extensive projects for Canada and New Zealand over a very wide area in Europe, and extensive and very satisfactory collections have been organised in Czechoslovakia of predators of *Adelges* spp. for Canada, with the assistance of the Czech Academy of Sciences. As a result of three years' work on the parasites of the oak leaf roller, *Lithocolletis messaniella*, in Europe by Dr. V. Delucchi excellent control is being obtained in New Zealand in areas where parasites have been liberated.

At the West Indian Station a number of projects have been undertaken for Barbados, Bermuda, Dominica (with Colonial Development and Welfare Funds), India, Jamaica, Mauritius, and Nevis, and in addition work for Mexico and Hawaii.

The Indian Station at Bangalore has increased its project activity and has now carried out work on the natural enemies of *Adelges* spp. for Canada, those of fruit flies for Australia, of sugar cane borers for India and Mauritius, of scale insects on tea and of the San Jose scale for India.

At the Pakistan Station work has also been done on *Adelges* spp. for Canada, and a project has started on the introduction of San Jose scale parasites which are being bred at the California Station. Investigation of the parasites of the cotton leaf roller has also been started.

In connection with all these projects a very extensive area has been explored by officers of all the stations.

63. In addition research on various aspects of these projects has been carried out and papers prepared describing the results.

Dr. Mesnil has continued work on the systematics of Tachinids, Dr. Lloyd has continued his work on host selection of mealy bug parasites, Dr. Delucchi has continued work on the natural enemies of the oak leaf roller, *Lithocolletis messaniella*, and Drs. Pschorn and Zwolfer on those of the woolly aphids of firs, *Adelges* spp., and of the larch sawfly, *Pristophora erichsonii*.

The Director in co-operation with Mr. Bennett at the West Indian Station, has begun work on the biological control possibilities involved in the presence of racial differences between populations of the parasite *Paratheresia claripalpis* from different areas.

Twenty-six papers totalling approximately *700* printed pages have been published by the staff during the year.

64. Section 2 Part 5 of the *Host Parasite Catalogue* dealing with Hymenoptera, Lepidoptera and Strepsiptera (*136* pages) was published during the financial year. *135* volumes of the catalogue were sold, and corrected copies of the parts which are out of print have been sent for reprinting. The whole of the operation of production of the catalogue has been transferred from Ottawa to the European Station.

65. Four definitely successful introductions may be recorded in 1958, although the work leading up to these was carried out in previous years.

(*a*) Successful control of the citrus black fly, *Aleurocanthus woglumi*, in the Seychelles by means of the parasite, *Eretmocerus serius*, shipped from Jamaica, W.I.

(*b*) Initial spectacular success of *Apanteles circumscriptus* introduced from Europe into New Zealand against the oak leaf roller, *Lithocolletis messaniella*.

(*c*) Establishment of *Cactoblastis castorum* obtained from South Africa in Nevis, W.I. in an effort to control *Opuntia* spp. It is too early to decide what degree of control, if any, will be obtained.

(*d*) Excellent control of the coconut scale, *Aspidiotus destructor*, in the Island of Principe, Portuguese West Africa, with a complete recovery of copra production following a decrease to 30% of normal following the introduction of the scale. This has been due to the introduction of the Coccinellid *Cryptognatha nodiceps* from Trinidad, W.I.

66. Approximately *310* shipments of *61* species, comprising a total of *304,051* individuals of beneficial insects were shipped to *21* countries during the year.

COMMONWEALTH BUREAUX

Animal Breeding and Genetics

67. *Staff*. Mr. Gethin resigned after the close of the year.

68. *Conferences and Committees*. Miss G. R. Ritchie attended the Tenth International Congress of Genetics at Montreal in August, 1958.

69. *Accommodation or Equipment*. The possibility of alternative accommodation at King's Buildings has been considered.

70. *Publications*. Volume 26 of *Animal Breeding Abstracts* contained four review articles, 2,157 abstracts and 130 titles. In the last two years there has been a slight but significant increase in the number of abstracts, amounting to just over 10%. The coverage list has been revised and continues to grow. The subject index was issued promptly soon after Part 4 of the volume was published. The number of subscribers to Volume 26 was 985.

Three Technical Communications were published and work on one other is well advanced. The three new Technical Communications were: *Dairy Cattle Breeding in the Tropics*, by P. Mahadevan, *Pig Carcass Evaluation*, by G. Harrington, and *Bird Hybrids: A Check-List with Bibliography*, by Miss Annie P. Gray. All have been favourably reviewed and commented upon. A reprint was also issued of three review articles entitled *The Genetic Improvement of Swine*, by H. T. Fredeen.

71. *Information Service*. There were 77 enquiries during the year, 35 from the United Kingdom, 26 from other Commonwealth countries and 16 from foreign countries and F.A.O. These included: a request for centres of research in the breeding of coarse-wooled sheep in India; information on the formation of a breed society in the tropics, to assist in establishing a society in Uganda; centres of meat research in the United Kingdom; information on chinchilla breeding. Bibliographies were supplied on vegetative hybridisation in poultry, sex control in animals, and on the yak. Photostat copies of published information on mule breeding were obtained for Nigeria. An enquiry of unusual interest, received from Makerere College, Uganda, was to assist them in obtaining day-old chicks to start a breeding programme on the new College Farm. We were able to arrange for the hatching and dispatch by air of the consignment of 150 chicks.

The Bureau also prepared five translations and supplied seven photostats.

72. *Library*. The Library issued on loan a total of 657 books and journals and borrowed 1,016 items.

73. *News-Letter*. An 8-10 page News-Letter has been sent each quarter to all the Official Correspondents of the bureau and some 100 other correspondents. Several appreciative letters have since been received.

Animal Health

74. *Publications*. All three periodicals are up-to-date and all have shown small increases in sales during the year. The volume index for the *Veterinary Bulletin* Vol. 28 is in the hands of the printer and should be issued by the end of April, 1959. The rate of increase in sales of *Veterinary Reviews and Annotations*, now in its fourth year, continues to be rather disappointing. Sales were 491 as against 428 in 1958 and the total distribution is 655.

No Technical Communications were published during the year. *Review Series No. 6* (*Fungal Diseases of Animals*) is in the hands of the printer at the time of writing this. It is being printed by the photo-offset process.

75. *Information Service*. The information service dealt with 90 enquiries (62 from the United Kingdom, 6 from the Dominions, 6 from other Commonwealth Territories and 16 from foreign countries). Among the subjects covered by these enquiries were: "Tembleque" a disease of grazing cattle and sheep in Argentina; Lupin poisoning of sheep in Western Australia; quarantine regulations against rabies in the United Kingdom; Johne's disease of cattle in Africa and Asia; interpretation of tuberculin tests in cattle; sources of veterinary literature; and many others. The library dealt with 1,200 requests for specific items of literature and 41 photostats and 2 microfilms were supplied.

Animal Nutrition

76. *Staff.* Two scientific assistants left and have been replaced by others with Honours degrees in Modern Languages. One had some training in Biology, the other is attending a University class in Zoology. Both are doing well and are already taking a fair share of routine.

77. *Publications.* (*a*) Few further additions have been made to the list of journals scrutinised and the final effect of the expansion in 1957 and from the 21 additional journals in 1958 can now be stated to be an increase of 817 abstracts and 180 titles. The total entries, numbered and unnumbered was 9,593 from 815 journals. All the numbers of Volume 28 appeared in the month of publication.

(*b*) Dr. Harvey (with Miss Anderson as interpreter) attended a meeting in Giessen in March of German and Austrian research workers, invited to discuss an international numerical indexing system for nutrition.

(c) Of the four Review Articles, the first two (the second a continuation of the first) came from the State Vitamin Laboratory, Copenhagen, author Finn Bro-Rasmussen, on riboflavin requirements; the third on balances of calcium and phosphorus in ruminants was prepared in the Bureau by Dr. Duncan and the fourth came from Nigeria and was by V. A. Oyenuga on livestock nutrition in that country.

78. *Information service.* There were 33 enquiries from the Commonwealth and 8 from other countries. Of the 38 enquiries dealt with 10 were concerned with questions of human diet or requirements. Five translations were provided, 4 from Russian and 1 from Danish.

Subjects of enquiries of special interest were, in the human field, diet in pre-war China, the "musulman" syndrome (Dachau), pyridoxine requirement; and in stock feeding, night starvation in cattle in Uganda, the estimation of blood volume in livestock, feeding standards for goats and sheep.

Publications borrowed from the Reid Library through the Bureau numbered 37.

79. *Sales.* Total circulation of *Nutrition Abstracts and Reviews* for the first time exceeded 2,000 (2,005); subscribers were 1,709.

Total value of sales of the journal, including back numbers, reprints and odd items was £12,864 and total value of circulation of Volume 28 was £12,692.

Dairy Science and Technology

80. *Staff.* Mr. J. M. Davies was appointed Assistant Director in October, 1958, the post having been vacant for one year.

81. *Publications. Dairy Science Abstracts* appeared regularly and punctually every month throughout the year. Volume 20 (1958) contained 2,693 abstracts and 315 title entries. Each monthly part contained a review article written by dairy scientists from 7 different countries.

Coverage of the literature continues to increase and some 520 journals are now scanned regularly, apart from numerous bulletins, annual reports, books and other publications. Over 36 per cent. of all abstracts and titles appearing in Volume 20 of *Dairy Science Abstracts* were from foreign languages, German continued to be the most important foreign language but the literature from the U.S.S.R. and other Eastern European countries showed another marked increase.

82. *Advertisements.* The journal has continued to prove a useful medium for commercial advertising and Vol. 20 contained 35 pages of paid advertisements.

83. *Distribution of Dairy Science Abstracts.* The number of subscribers rose from 993 for Volume 19 to 1,023 for Volume 20, and total distribution of the journal from 1,182 to 1,240 respectively.

84. *Information Service.* A total of 149 enquiries was received and dealt with during the year. Of these, 72 came from Great Britain, 31 from different parts of the Commonwealth and 46 from foreign countries.

As in previous years, the nature of the enquiries received varied considerably, from straightforward requests for photostat copies to the preparation of long bibliographies. Three of the enquiries received requesting information on mobile milking services, the use of dried skim-milk in bread, and the effects of calf nutrition on subsequent lactation performance, came from important Government Committees in the United Kingdom. Typical examples of other enquiries were as follows: equipment for concentrating and drying whey (Pakistan); pasteurization vs. sterilization of milk under tropical conditions (Nigeria); information on plastic milk bottles (Australia); references on radioactivity in milk (Italy); list of journals and books on dairying published in the United Kingdom (India); chemical and bacteriological control in the production of tinned sterilized cream (N. Ireland).

Forestry

85. *Staff.* A rather difficult year of change. One Scientific Assistant resigned, the vacancy not being satisfactorily filled for 7 months; there was a change of Senior Clerical and two changes of typist.

86. *Publications.* (*a*) The preparation of *Forestry Abstracts* continues to be the major pre-occupation of the scientific staff. With one exception, the numbers appeared regularly each quarter; part of the index to Volume 19 is in the press. The new type of

leading article has been welcomed by the Commonwealth. Volume 19 contained 5,078 abstract notices, the highest yet.

(*b*) *Coverage of literature.* A complete reappraisal has begun in connexion with the revised type of Coverage List, and is likely to involve numerous discards of "borderline" literature.

(*c*) *Special Project.* Compilation of Part II (subject and geographical) of the 5-year Index to *Forestry Abstracts* Volumes 1-5 has begun.

87. *Information Service.* (*a*) A total of 30 enquiries was received from member or associated countries, and 2 from foreign countries (the same total as last year). Among topics on which information was provided were:

(i) Forestry in Bulgaria;
(ii) Forest seed testing and storage;
(iii) Tree planting machines in the sterling area;
(iv) Avenue trees for Gibraltar;
(v) Use of livestock on forest land;
(vi) Plant growth regulators to control insect pests;
(vii) Wood-waste utilization;
(viii) Manufacture of wood charcoal;
(ix) Wood distillation equipment;
(x) Federal forest policies.

(*b*) In addition there were 56 requests for literature; 3 photostats and 3 translations were supplied.

88. *Centralized Title Service.* Four more Commonwealth countries joined (total subscribers, 38), while the foreign countries remained steady at 53. The service now goes to 91 centres at a rate exceeding three-quarters of a million cards annually.

This bureau continued to run the Botanical Pool of circulating literature (some 243 items) and to distribute scientific literature received at Head Office.

Helminthology

89. *Staff.* Dr. J. M. Watson succeeded Professor Leiper as Director on 1st June, 1958.

90. *Identifications.* Materials received for identification were dealt with by the Director pending the appointment of a taxonomist. All necessary preliminary steps have been taken for the equipping and furnishing of a taxonomy laboratory and the appointment of a suitably qualified taxonomist during the forthcoming year.

91. *Publications.* (*a*) Volume 24 of *Helminthological Abstracts*, with author, subject and periodical indices, was completed and published during the year.

(*b*) A first supplement to *Nematode Parasites of Plants Catalogued under their Hosts*, covering the years 1955-58, by Dr. J. Basil Goodey and Dr. Mary T. Franklin is now in the press.

The following occasional publications are in course of preparation:

A *List of Plants Resistant to Meloidogyne*, by Dr. Mary T. Franklin and Mr. D. J. Hooper;

Ecology of the Free-living Stages of the Nematode Parasites of Sheep in Relation to Flock Behaviour and Population Dynamics in Host and Parasite, by Dr. H. D. Crofton *et al.*

Proprietary and Chemical Names of Anthelmintic Preparations, by Dr. S. M. Willmott.

92. *Information Service.* Fifty-six requests for information were dealt with, 47 from contributing countries and 9 from non-contributing countries. The topics included:

Control of red-ring disease in coconuts in the Seychelles; validity of the name *Heterodera major* as against *Heterodera avenae* for the oat eel-worm; control of tobacco eel-worms and the pyrethrum eel-worm of Kenya through root secretions of *Crotalaria* spp. and *Tagetes* spp. and by predatory fungi; methods of investigating soils, roots and other material for eel-worm infection; the influence of environment on plant nematodes.

Prevalence of helminth parasites transmissible through meat to man, occurring in European countries; early historical identification of *Dictyocaulus viviparus* in cattle; use of gamma rays for the sterilization of beef containing *Cysticercus bovis* and pork containing *Cysticercus cellulosae* and *Trichinella spiralis*; parasitic diseases of cattle, sheep and pigs in Iron Curtain countries; incidence of helminth infections of pigs in Commonwealth countries; results of research on helminth parasites of sheep in relation to world sheep production; urinary schistosomiasis as a natural infection in pigs; changes in serum proteins of cattle infected with *Fasciola gigantica* and resistance to this infection.

Occurrence of *Cercaria ocellata* in Britain; life-cycle of *Mecistocirrus digitatus*; location of type specimens; international rules of Zoological Nomenclature governing the date on which priority of a new species is established.

Effects of chlorination of water on the eggs of *Ascaris lumbricoides*; possibility of contamination of tinned foods by entry of helminth eggs in the cooling water in the case of faulty cans; world incidence of hydatid disease; evidence for the existence of schistosomiasis in ancient Iraq.

Organisation and compilation of author and subject indices.

93. Requests for the loan of specific items of literature numbered 95.

94. Five translations were supplied on request: four from Russian and one from Portuguese.

95. *Miscellaneous.* A tea-party was held at the Bureau on Monday, 21st July, 1958 in honour of distinguished helminthologists attending the 15th International Zoological Congress in London. Twenty-one guests from six different countries attended.

The total number of overseas visitors during the year numbered 32.

Horticulture and Plantation Crops

96. *Staff.* On 31st March, 1959, the director, Mr. D. Akenhead, after exactly 30 years in charge of the bureau, including 14 years as director, handed over to his successor, Mr. G. K. Argles.

97. *Publications.* (*a*) *Horticultural Abstracts.* Volume 28 was published on time. It contained abstracts, notes or reviews of 5,815 original publications including 70 books. The yearly index appeared early in February. The number of subscribers rose from 1,218 to 1,262.

(*b*) *Occasional publications.* T.C. 25, *Abstract bibliography of fruit breeding and genetics to 1955*: Rubus *and* Ribes—*a survey*, appeared in December, 1958, and in the same month also both T.C. 26, *Horticulture in the British Commonwealth—an outline*, and a new venture with special appeal to the Advisory Officer, Digest 1, *The bulk harvesting of orchard fruit.*

98. *Information Service.* Enquiries dealt with totalled 150, which comprised 66 from the United Kingdom, 34 from the Dominions, 26 from the Colonies and 24 from foreign countries.

Official Correspondents and all readers of Horticultural Abstracts were notified of the availability of replies to 120 enquiries, and 156 persons requested and received copies, the actual number of items despatched to meet this demand being 693.

Subjects of enquiries dealt with which particularly indicate modern tendencies include the following: The use of boron for frost protection (Q.F. 3454)—incidentally more exact trials have not as yet confirmed early promise; use of caustic and particularly hormone sprays for thinning flowers and fruits (Q.F. 3480); mulching vegetables with aluminium foil and plastic films (Q.F. 3399); estimating flowering and harvesting dates by the use of temperature sums (Q.F. 3445); cultivation of stemless (and incidentally so far tasteless) mushrooms (Q.F. 3365).

99. *Translations.* 17 short translations were made from the following languages: Dutch 7, Russian 5, French 3 and German 2.

100. *Publicity.* Bureau publications were displayed at the XVth International Horticultural Congress held at Nice in April, 1958, and at Chelsea Flower Show, London, in May, 1958. A single advertisement in the Journal of the Royal Horticultural Society with a circulation of 55,000 had little effect.

Pastures and Field Crops

101. *Publications.* The journals *Herbage Abstracts* and *Field Crop Abstracts* appeared on time each quarter. The total number of abstracts and titles, derived from 11 languages, was 1,672 in *Herbage Abstracts* and 1,877 in *Field Crop Abstracts.* Taking the two journals together, these figures represent an increase of approximately 27% compared with those of two years ago. In addition to the usual abstracts, each issue of both journals included a commissioned review article on some aspect of agricultural research. The annual subject and author indexes of *Herbage Abstracts* and *Field Crop Abstracts* were published with the last issue of each volume. A revised list of 996 world periodicals and reports received regularly in the Bureau for abstracting was prepared for publication. Three technical communications were in course of preparation. There was a small increase in the number of subscribers to *Herbage Abstracts* (5%) and *Field Crop Abstracts* (3%).

102. *Information Service.* 86 enquiries (78 from Commonwealth countries and 8 foreign) were dealt with (an increase of 56% in 2 years), plus 173 requests for references to scientific literature and 77 requests for photostat or microfilm copies.

Enquiries received covered the following subjects, amongst others:

Seeds mixtures and seed rates for long leys; nitrate content of pasture plants; laceration of fodder for silage; grazing management with electric fences; swede turnips; noxious nitrogen in sugar-beet; growth rate of grasses of different spp. at different seasons and under different cutting treatments; seed dormancy in *Alopecurus myosuroides*; measurement of grassland production in terms of food units; establishment of grasses on acid, moorland soils; aborted seed in groundnuts; fodder-growing in nutrient solutions; effect of cutting on forage; plant spacing of potatoes, the cutting of seed potatoes; maize under irrigation; effect of undersowing on barley; the effect of row spacing on the agronomic characteristics of wheat, barley, oats and flax; the effect of plant density on yield of cotton; *Vicia sativa*; depth of germination of weed seeds; the potash content and requirements of lucerne; nodulation of clovers in Africa; methods for sampling pastures.

Lists of the more important enquiries answered were published in *Herbage Abstracts* and *Field Crop Abstracts* and 65 carbon copies of the replies were sent to those who asked for them.

103. Thirty-nine scientists from overseas visited the Bureau during the year. The Director visited agricultural research centres in Denmark during June.

Plant Breeding and Genetics

104. *Plant Breeding Abstracts* has continued to appear punctually at the beginning of each quarter. The index to the last completed volume has been issued. Volume XXVIII contained 4,853 abstracts, 94 book reviews and 15 new journal notices. Publications in 37 languages were examined for the preparation of *Plant Breeding Abstracts*, and four other languages were dealt with in the course of the bureau's work.

105. There were 57 technical enquiries, 52 from contributing countries and 5 from foreign countries. These included requests for information on the following topics: lupin poisoning and male sterility in cereals, for Australia; jute germination, for British Guiana; haploidy, winter hardiness in cereals, trisomics in wheat and rye, wheat dormancy, *Amaranthus* breeding, rust resistance in flax, taxonomy and cytogenetics of safflower, and *Fusarium* root rot of beans, for Canada; capsaicin content of peppers, and induced mutation in fruits, for India; segregation data in sugar cane, for Mauritius; interspecific rice hybrids for Nigeria; cowpea breeding, for Nyasaland; cotton breeding, tea quality, and genetics and breeding of jute, for Pakistan; natural cross-pollination of rice, for Sierra Leone; rust resistance of lucerne, for Swaziland; and plant breeding in China, genetic effects of grafting, German seed-production terminology, cytogenetic effects of kinetin, cereal embryology, yellow rust of wheat, synthetic maize production, *Lathyrus* breeding, cotton breeding in the U.S.S.R. and virus yellows of beet, for the United Kingdom.

106. Requests for specific items of literature totalled 80; 77 requests were made for bibliographies previously compiled. Five translations were made, two from Italian, two from Russian and one from Swedish. Requests for typescript, photostat or microfilm reproductions totalled 44.

107. Assistance in obtaining genetic material of Italian wheats was rendered to Canada; similar assistance was given to two research workers in the United States.

108. The visitors to the bureau included: O. H. Frankel and A. T. Pugsley from Australia; H. Hänsel, from Austria; H. D. Griesau, from Germany; M. L. Magoon, from India; F. D'Amato and G. T. Scarascia, from Italy; E. Malinowski, from Poland; and H. E. Brewbaker, from the U.S.A.

109. The director attended the International Symposium on Fodder Plants in Poznań, Poland, June, 1958, and the International Conference on Scientific Information at Washington, U.S.A., November, 1958. The director made a tour of Canadian and United States research stations during October and November, 1958.

110. Referring to Technical Communication 12 of the Bureau, T. D. Lysenko, the central figure of Russian plant breeding controversies, stated that he was acquainted with only about half the Russian work cited in the bibliography.

Soils

111. Abstracting and publication of *Soils and Fertilizers* are up to date. Volume XXI (1958) contained 2,462 abstracts and six review articles. In all, about 5,000 papers, etc. were indexed. Several new journals dealing with soil science came under review.

112. No Technical Communication was issued during the year. *Relations between Water and Soil* was brought near to publication. Some progress was made with *Vegetation, Climate and Water Supply* and *Shifting Cultivation and Plant Nutrients*.

113. The number of enquiries received was 108, compared with 109 last year. Of these 64 came from the United Kingdom, and 34 from other contributing countries, namely, India 10, Australia 6, Canada 4, Union of South Africa and Federation of Rhodesia and Nyasaland 3 each, Ceylon, Republic of Ireland and Kenya 2 each, Basutoland and Sarawak 1 each. Among the subjects of enquiry were: ammoniation of coal (India); effect of potash on wheat quality (Ireland); decomposition of herbicides (Kenya); sampling error in soil-moisture determination (New Zealand); manure gas (United Kingdom); dewponds (United Kingdom); soil micro-climates (Ceylon); absorption of radio-active fall-out by soil (U.S.A.); oxygen requirement of rhizobia (Canada).

114. Eleven translations were made from Russian, two from German, one from French and one from Hebrew.

115. Seventy-two annotated bibliographies were prepared.

NOTES OF PROGRESS IN THE AGRICULTURAL SCIENCES, BY DIRECTORS

Mycology and Plant Pathology

116. *General.* Three events of significance for future world co-operation in the field of plant pathology have occurred during the past three years. They are the fiftieth anniversary of the foundation of the American Phytopathological Society, and two

international congresses on plant viruses: one, on potato viruses, held in Holland, the second on the 'stolbur' complex, held in Czechoslovakia. At the first, authorities of all nationalities pooled their specialized knowledge and the results will be published as a book during 1959 in what may well be a milestone in the history of phytopathology. At the other two, advances in virus research were consolidated and a good deal of the mystery surrounding 'stolbur' was removed. It was shown to be not a specific disease but an ecological condition involving crops and a number of wild plants, whose seasonal appearance governed the distribution of the insect vectors of the virus. This exemplifies the broader conception of virus diseases which characterizes modern research.

117. In 1956, the Inter-African Phytosanitary Commission held its first meeting to devise means of preventing the introduction into Africa of dangerous crop pests and diseases not already present there and to check the dissemination within the continent of those already established but of restricted distribution. Disease and pest surveys have been and are being prepared and a large measure of agreement arrived at between the various states for the introduction of more uniform plant protection legislation. Already several governments have issued revised schedules.

118. There has been a steady increase in research in phytopathology and mycology as evidenced by the increasing number of abstracts published in the *Review of Applied Mycology* (1956, 2,803; 1958, 2,914). Research has tended to be less superficial than in the past. Greatly increased attention is being paid to such problems as the physiology of infection, especially the biochemistry of the host-pathogen reaction, and the mechanics of fungicidal spray application, particularly the physics of droplet size and its relation to leaf coverage. The study of viruses is rapidly developing into a new science and the better understanding of plant virus diseases is being assisted by research in other branches of biology such as medicine and veterinary science, thus bringing phytopathology into the same category using the same techniques.

119. *Bacteria.* There has been a noticeable increase in the attention paid to plant pathogenic bacteria, especially in the realms of taxonomy and nomenclature. New and improved editions have appeared of Bergey's *Manual of Determinative Bacteriology* (7th ed. 1958), W. J. Dowson's *Plant Diseases due to Bacteria* (1957), and Stapp's *Pflanzenpathogene Bakterien* (1958), but there are still many gaps which need filling, as instanced by D. W. Dye of New Zealand and others, who have shown that it is still not possible to name with certainty species of phytopathogenic bacteria in the absence of successful inoculation of the host plant.

There is a tendency, which needs considerable acceleration, to adopt serological methods, but in most centres facilities are not available for this kind of work. Few plant bacteriologists have, for example, a ready supply of serum at hand, or a reliably typed collection of phytopathogenic bacteria and their phages. Even so, bacteriophages and serological methods were used successfully by J. E. Crosse in the eradication campaign against the recently introduced fireblight of pears in England for the vitally important rapid diagnosis of the causal organism, *Erwinia amylovora*, and to distinguish it from the blossom wilt bacterium, *Pseudomonas syringae*.

120. One of the scourges of agriculture in the tropics is the bacterial wilt organism, *Pseudomonas solanacearum*, the control of which has defied pathologists for a great many years. This may be because research has been directed towards field control without a sufficiently full understanding of the mechanism of the pathogen, and there is hope of an advancement in our knowledge of this disease in the recent work of A. Husain and A. Kelman in North Carolina on the relation of extracellular polysaccharide slime to the mechanism of wilting and pathogenicity, and the rôle of pectic and cellulolytic enzymes in the destruction of host tissue.

121. Practical success has, however, been obtained by the use of antibiotics and antimetabolites such as streptomycin and thiouracil in the control or eradication among other diseases of cherry canker and silver disease of beet in the United Kingdom, bacterial blight of beans in Australasia, bacterial canker of olive in Italy, bacterial diseases and mosaic virus disease of tobacco, and virus diseases of stone fruit trees in the United States, whilst a reduction of initial infection with bacterial blight of cotton below the level which gives significant increases in yield has been obtained by G. M. Wickens in Uganda by the use of mercurial seed dressings.

122. *Fungi.* Fundamental work on the taxonomy of pathogenic fungi has received an impetus by the publication of a number of comprehensive works. G. B. Cummins in the United States has produced a host index and descriptions of the grass and cereal rusts of the world, S. J. Hughes in Canada (at one time on the staff of the Institute), has published a work of great use to those studying the important group of fungi, the Hyphomycetes, revising about 400 genera and 1,000 species of microfungi, J. A. von Arx has made an exhaustive revision of the important and difficult genus *Gloeosporium*, whilst M. B. Ellis and F. C. Deighton at the Institute continue to write monographs of important groups, providing keys to genera not previously monographed.

R. H. Cammack, in Nigeria, has made a statistical study of the spore sizes and world distribution of the tropical maize rust, *Puccinia polysora*, which has been of service in the determination of the origin of the diease and of physiologic races of the fungus.

The International Seed Testing Association (ISTA) is devoting more attention to seed pathology and held the first international meeting on this subject in 1958, in England. The Commonwealth Mycological Institute in collaboration with ISTA, published *An Annotated List of Seed-borne Diseases* in the same year, and also participated in a report by the European Plant Protection Organisation on means of preventing the introduction of seed-borne tropical and sub-tropical diseases into the Mediterranean basin. This is quite significant activity in a branch of pathology neglected in the past.

P. H. Gregory and J. M. Hirst, at Rothamsted, have continued to break new ground in their study of the fungus spore population of the atmosphere and of climatic factors determining outbreaks of disease by means of a wind tunnel, an accurate volumetric spore trap, and an ingenious apparatus which records moisture deposit on crop plants. Closely allied to this work is the formulation of accurate crop disease surveys on a continent-wide basis by E.C. Large, with a consequent improvement in disease forecasting and spray warning systems.

Fungal root diseases, particularly of tropical plantation crops, have been an almost insoluble problem for many years. Recently advances have been made in techniques for detecting fungi of the rhizosphere which are beginning to give a true picture of the soil mycoflora. As a partial consequence of these studies attention has been directed to the rôle of nematodes in the initiation of root diseases and research on fungal infection of roots of a number of crops has been given a new twist. The control of root disease of *Hevea* rubber in Malaya has progressed by the discovery at the Rubber Research Institute that the method of routine inspection in practice for a long time appears to stimulate penetration by *Fomes* and that less infection occurs in undisturbed trees. It has been shown that virulent and benign races of the fungus exist, a matter of considerable importance to plant breeders when breeding for resistance, and stump infection by wind-borne spores has also been established as an important phase of the disease, which can be prevented by fungicide treatment.

123. Discoveries have been made of considerable importance to veterinarians. For instance, *Sporidesmium bakeri* has been found to be widespread on the grasses of New Zealand pastures where sheep are subject to facial eczema of which this toxic fungus is suspected to be the cause. Again, in the United Kingdom mouldy hay contaminated by *Aspergillus* spp. which is a cause of heavy losses due to aspergillosis in chicks has been shown by P.K.C. Austwick to be a source of mycotic abortion in cattle. It is associated with farmers' lung in man, and a comprehensive study has been begun by P.H. Gregory of the fungus flora of normal and mouldy hay.

'Lumpy wool' (or mycotic dermatitis) of sheep which is long known in Australia and New Zealand has been found to be widespread in the United Kingdom where Austwick has recently established the taxonomic position of the causal actinomycete.

124. A most notable advance in the treatment of ringworm—both of man and animals—was made in 1958 by J. C. Gentles, I. Lauder, and J. G. O'Sullivan at Glasgow where it was discovered that the antibiotic griseofulvin (which had shown possibilities as a systemic fungicide against fungus diseases of lettuce and tomato) eliminated ringworm infection in laboratory animals and calves when administered orally.

125. *Fungicides*. The practical approach to the use of fungicides has shown much change in recent years. Purely protective sprays, which have been in conventional use for over a century, are being replaced by eradicants and inhibitors of fungal growth. Small droplet, low volume spraying, using amounts of fluid as low as 1 gallon per acre, has very largely replaced high volume spraying of up to 400 gallons, with a consequent saving in the considerable expense and inconvenience of water cartage Low volume application has also made feasible the wider use of aircraft, especially helicopters, for crop spraying and there are indications that aircraft will before long largely replace the heavy ground machines now in use. The former show to the greatest advantage over difficult terrain or when land is too wet or the crop too advanced to permit ground machines to give a late application. Aerial spraying was mainly instrumental in saving the potato crop in Britain from destruction by blight in the wet summer of 1958.

A modification of this which has had outstanding success in the control of banana leaf spot, notably in the Caribbean and parts of Africa, is the substitution of oil for water in the spray fluid. Even oil alone without an adjuvant has provided successful control owing to its power to inhibit mycelial growth after penetration by the fungus has occurred.

Eradicant sprays such as phenyl mercury compounds and DNOC have shown increasing success against apple scab and are rapidly replacing protective sprays, whilst it appears that the very damaging coffee berry disease in Kenya may eventually respond to mercury.

126. *Viruses*. With the aid of the electron microscope and improved techniques the virus particle

has been demonstrated to consist of a core of nucleic acid inside a case of protein, the former being the active principle. The two constituents have been separated and re-united without functional impairment and the conception of a virus as a parasitic organism is no longer generally accepted. The problem of the control of virus diseases, however, still remains, but there have been several important steps forward. Heat therapy of planting material is now in general use and successful control of, for example, ratoon stunting disease of sugarcane has been accomplished in many countries. The same method is being applied to horticultural stocks, and when combined with growth stimulation by the use of hormones such as gibberellic acid it has been found possible to produce virus-free meristems for the propagation of healthy clonal material. Furthermore, it is now known that the presence of viruses can be detected by the use of purines and pyramidines, so that with their aid it is becoming possible to issue reliable health certificates for such stock.

It will be seen, therefore, that considerable progress has been made during the past few years in the practical control of plant diseases and that Commonwealth countries have contributed in no small part to the knowledge gained.

Veterinary Science

127. The last occasion on which notes on veterinary science were contributed to the Annual Report was in April, 1955 and problems arising from methods of husbandry, such as the use of growth stimulants, preservation of semen for use in artificial insemination, highly intensive methods of poultry management and uses of endocrine products to regulate breeding seasons, received rather more space than purely disease problems.

In the four years which have elapsed these aspects have continued to be actively studied and have been the subject of a large number of publications. Addition of antibiotics to foodstuffs with the object of stimulating the rate of growth has become almost accepted practice in poultry and pigs. Fears that their use might have adverse effects either on the livestock themselves or on human beings eating meat or eggs from livestock receiving antibiotics, or by leading to the development of antibiotic-resistant strains of pathogenic organisms, seem to have decreased somewhat. Reports continue to be rather conflicting on the efficacy and economics of these agents and there is still no clear understanding of the mechanism of their action in stimulating growth.

Preservation of semen by freezing at very low temperatures is now quite widely used and research on improved diluents is still being very actively pursued.

The use of endocrine products for inducing oestrus and ovulation in sheep and cattle has gone rather beyond the purely laboratory stage and is becoming the subject of quite large field trials. In the United Kingdom it is hoped that these methods may prove to have considerable application in the production of beef cattle as a by-product of the dairy industry. If the less efficient dairy cows which are not required to produce dairy replacements can be made to produce twin calves after insemination with semen from beef bulls a useful contribution to the meat supply might be obtained.

In the field of diseases of animals perhaps the most striking developments have been in virology and parasitology.

128. *Virology*. Research has been greatly stimulated by developments in tissue culture methods.

Methods for in vitro growth of tissue cells have been known for many years but until recently they have been used only by a limited number of specialists. The development of antibiotics has simplified the technique, and made possible great extension of this method as a laboratory tool (*a*) for fundamental studies of the growth of viruses in the body cells (*b*) for diagnosis of virus infections and (*c*) for production of large quantities of viruses in a relatively pure state at a cost that has greatly improved the possibilities of producing efficient vaccines against virus diseases. The greatest success so far has been the development of vaccine against poliomyelitis in man.

In the veterinary field this lead has been taken up and very interesting progress has already been made in cultivating the viruses of swine fever, foot and mouth disease and rinderpest, to mention only a few of the more important virus diseases. While in the past progress has been handicapped by the impossibility of cultivating viruses except within the bodies of experimental animals, the new tissue culture methods make it possible to cultivate them in flasks with consequent great economies in cost and laboratory space.

Improvements in the technique are being made rapidly and great advances are to be expected in the near future.

In the diagnosis of virus diseases gel diffusion tests are being studied for their possible application in diseases such as rinderpest and swine fever. No convenient laboratory tests for quick and accurate diagnosis of these diseases are at present available. A reliable test suitable for routine use would be very helpful.

129. *Parasitology*. Recent years have been marked by a growing interest in the immunology of helminth infections. In the past helminthologists have concentrated largely on studies of the worms themselves, of their life cycles and of anthelmintic drugs for treatment of established infections. Control has been by methods based on knowledge of the life cycle;

by the use of anthelmintic drugs; and by adequate nutrition of the host animal to enable it to tolerate the worm burden.

Attempts have been made from time to time to produce immunity by the use of vaccines. The vaccines tried had consisted of preparations made from killed worms and no practicable vaccine had been developed either for human or veterinary use.

130. *Lungworms.* A very interesting recent development has been the production of a vaccine against the lungworms of cattle by workers at the Glasgow Veterinary School in Glasgow University. It was found that by exposing lungworm larvae to carefully adjusted doses of X-rays they could be modified in such a manner that while still capable of penetrating into the tissues of cattle and of migrating through them to the lymph nodes they were incapable of proceeding onwards to the lungs. They got as far as the lymph nodes where they died and stimulated the production of antibodies. Laboratory studies showed that vaccinated calves were protected against heavy infecting doses and field trials have indicated that a degree of immunity sufficient to protect against heavy natural infection can be produced by vaccination.

This finding is particularly interesting as being the first occasion on which an effective vaccine against a helminth parasite has been produced. The use of radiations to modify a parasite without killing it outright is also of great interest. Much work has still to be done but this new method opens up possibilities of protecting animals and also man against a variety of helminth parasites and already the method is being studied with hookworms, schistosomes and hydatids.

Another notable advance has been the production of a chemotherapeutic agent effective against lungworms in cattle. Lungworms are the cause of parasitic bronchitis, generally called "husk" or "hoose", which is responsible for heavy losses especially in young cattle in many countries in the temperate zone. Numerous drugs have been tried in the past but none of them were really specific. The new drug cyanacethydrazide produced in the laboratories of a pharmaceutical firm in Great Britain seems to be specific and very effective in removing the adult worms from the lungs.

131. *Parasitic enteritis* in lambs caused by round worms of the genus Nematodirus has occasioned heavy losses in recent years. The worms responsible had proved to resist treatment with the older anthelmintics. A new drug (a product of a British pharmaceutical firm) bephenium embonate has given very good results both in the laboratory and in field trials.

132. *Warble fly control.* Another considerable advance concerned an arthropod parasite, namely the warble fly, the larvae of which cause severe damage to hides in many parts of the world. In the past control has depended upon hand dressing the skins of affected cattle with preparations containing derris. The dressings killed the larvae and their continued use could greatly reduce the warble fly population but their application was time-consuming and expensive in labour. A number of organophosphorus compounds have been developed in America and Germany, some of which can be administered by the mouth. These "systematic parasiticides" kill the fly larvae at an early stage of their development before they reach and damage the hides. In laboratory and field trials it has been demonstrated that one dose administered in the summer causes a dramatic decrease in the number of warbles which develop in the hide in the following spring. The drugs in addition to being efficient against the warbles caused by *Hypoderma* spp. in temperate zone countries have also been found effective against *Dermatobia hominis* which is a problem in South America.

These drugs are potentially toxic and fears of poisoning in man by residues in the meat and/or milk of treated cattle have led to a close study of the question. In the U.S.A. the authorities have approved their use in beef cattle provided the treated cattle are not slaughtered before at least six weeks have elapsed from the time of treatment. The use of the drugs in dairy cows is not permitted.

133. *Animal trypanosomiasis.* The search for new and more effective drugs for treatment of nagana in cattle in Africa has been actively pursued in the years following the second World War, particularly in British laboratories, and great advances have been made. In more recent years this work has turned more in the direction of the discovery and development of long-acting drugs which could be used prophylactically and which would permit cattle to be maintained in areas infested with tsetse flies.

This work has been greatly stimulated by the demonstration in West Africa that combinations of suramin with other trypanocidal drugs formed relatively insoluble complexes which gave protection over periods as long as seven months. Research in this field is being actively pursued. Many of the suramin complexes have the serious disadvantage that they cause very severe tissue reactions with abscess formation at the site of injection. This problem, however, is doubtless capable of solution. The work on these long-acting drugs opens up the possibility of developing immunity in cattle by rearing them in tsetse fly-infested areas under the protection of one or other of these new substances.

134. *Cobalt deficiency.* Sheep rearing on pastures in areas where the soil is deficient in cobalt becomes possible and economic when the lacking cobalt is

supplied. This can be done by applying fertilizers containing cobalt to the soil or by dosing the sheep.

Application of cobalt-containing fertilizer is expensive and dosing is not practicable in large flocks because although very minute quantities of cobalt are required it must be administered at frequent intervals.

An extremely ingenious method to surmount these difficulties has been developed by C.S.I.R.O. workers in Australia.

The method is based on the well-known fact that heavy metallic objects such as coins, when swallowed by ruminant animals will remain in the stomachs (reticulum and rumen) for many years without causing any disturbance of health.

The C.S.I.R.O. workers have developed so-called "cobalt bullets" which consist of cobalt salts mixed with certain clays, moulded into boluses and baked in an oven. The cobalt bullet is given to the sheep by means of a balling-gun. It remains in the stomach for a very long period and the small quantities of cobalt continuously leached out from it are sufficient to supply the requirements of the sheep.

135. *Facial Eczema.* This condition which occurs from time to time in sheep grazing on rye-grass pastures has become a serious problem in New Zealand where it has been intensively studied for some years. The prominent features of the disease are liver damage followed by photosensitization. It is not infectious and is strictly seasonal in occurrence. Much work of a biochemical nature has been done in an endeavour to locate and identify the toxic substance responsible. A very interesting finding is that the spores of a fungus (*Sporidesmium bakeri*) which parasitizes the rye-grass contain a toxic substance which reproduces the typical liver lesions and symptoms when fed experimentally to laboratory animals and to sheep.

This finding is an example of the potential value of mycological study, which could be applied to a number of obscure diseases. Staggers-like diseases of grazing livestock occur in many parts of the world and the causation of most of them is still obscure. It is quite possible that the mycologist may have an important contribution to make and doubtless the New Zealand work will stimulate interest in this direction.

136. *Toxicology.* The very rapidly increasing number of new parasiticides, weed killers, chemotherapeutic agents, tranquillizers, etc., and the wide extension of their use has raised problems of toxicity. Losses of livestock from poisoning by parasiticides and weed killers have occurred, in most cases as a result of carelessness. Where reasonable precautions have been taken little trouble has arisen.

The growing practice of adding chemotherapeutic substances to food mixtures, particularly for poultry and pigs, requires study of the possibility of chronic poisoning resulting from prolonged ingestion of small amounts. Short-term toxicity trials are inadequate and it has been suggested that in some cases trials covering at least two generations of the test animal would be required before it could be categorically stated that a given substance was harmless. Regulatory authorities are faced with a difficult situation in deciding whether the use of such new substance can be approved or not, and also in framing regulations concerning the adequate labelling of food mixtures containing these substances.

137. *Subnormal fertility in cattle.* Much study has been devoted to the causes of this very common condition. Infective diseases such as brucellosis, vibriosis and trichomoniasis which account for some of the cases have been brought under control in many countries. Strain 19 vaccine has greatly reduced abortions caused by brucellosis, artificial insemination has prevented the spread of trichomoniasis and curative treatment of bulls by antibiotics has greatly lessened the importance of vibriosis.

In spite of the control of these three infections, reduced fertility continues to be a serious trouble in many herds.

The part played by nutrition in determining the level of fertility has been the subject of many studies but results obtained have been conflicting and very difficult to interpret and no clear lead seems to be emerging at present. Death of the embryo at a very early stage of its development does appear to account for some of the suboptimal fertility and the causes of this are being studied. Maternal and embryonic incompatibility as a result of phenotypic differences has been suggested as a possible cause.

138. *Radiations.* Knowledge of the action on farm animals of ionizing radiations from nuclear explosions is rapidly growing. Much attention has been paid to the assimilation by grazing animals of products of radioactive fall-out, and determinations of the concentrations of radiostrontium in bones and milk from cows are being used to assess the extent of fall-out.

The use of radioactive isotopes in biochemical, haematological and physiological studies on domestic animals is now firmly established and their use has greatly facilitated many branches of research.

139. *Mycology.* Interest in the rôle of fungi in causation of disease in livestock has increased in the period under review. Such conditions as mycotic abortion in cattle, mycotic dermatitis in sheep, streptothricosis of cattle (particularly in Africa) are

being studied and are proving to be more widespread and important than had been realized previously. In America histoplasmosis and coccidioidomycosis are now known to be quite widespread and they have been the subject of many papers. Toxic effects of fungal contaminants of foodstuffs have received special attention particularly in Russia. The work on facial eczema in New Zealand has been mentioned already as an example of the importance of mycological investigations. In Rhodesia ergot contaminating sorghum has been incriminated as the cause of a form of agalactia in sows. An interesting finding has been the discovery in Great Britain that the antibiotic griseofulvin has a curative effect on ringworm in calves when given by the mouth. Ringworm of young cattle is very common and no satisfactory specific treatment has been available before.

Pastures and Field Crops

140. Progress in the agricultural sciences during the past three years, as it concerns grassland and annual field crops, presents a picture of unspectacular but steady advance, with notable developments in certain directions.

141. *The significance of leaf area in pasture growth.* Recent work indicates that the application of the concept of leaf-area index (LAI) to problems of pasture growth may have great potential value. When the supply of water and plant nutrients is adequate, light may become the factor which governs the productivity of a pasture. Attempts to increase pasture production above the high levels recorded in some areas may be in vain unless this limiting factor is fully appreciated. When considering the problem of increased production under conditions of non-limiting water or nutrient supply, two approaches are possible each involving the more effective use of the light supply: (1) the sward can be managed so as to secure a high rate of production of leaf dry-matter over as long a period of the year as possible, (2) an attempt can be made to establish a higher LAI ceiling by using alternative pasture species. There is a need to reassess the value of early growth (when LAI is low) in terms of its effect on LAI and the rate of plant growth. The significance of large seed and of a dense plant population in the early attainment of optimum LAI in annual pastures has been demonstrated.

The decline in the rate of dry-matter production as LAI reaches high levels has clear significance in grazing practice and gives new meaning to the disadvantages of overgrown pasture.

Whenever pastures form a continuous canopy of foliage, the study of light as a limiting factor in production, and of LAI as a criterion of light interception, deserves study. The need for such studies is emphasised by Indian experiments in which maize was shown to give significantly higher yields of grain and fodder when grown in rows lying north and south, as opposed to east to west, because of the better exposure of the plants to sunlight (*Herb. Abstr.* 28, No. 1, pp. 1-6; *Fld. Crop Abstr.* 9: 396, 653).

142. *Photosynthesis and the theory of crop yield.* The course of formation of the photosynthetic apparatus and its efficiency is basic to the problem of finding the optimal conditions for crop growth. Russian work with several crops shows the importance of the photosynthetic potential, defined as the integral of the leaf-area of the plant community over the whole vegetative period. It is suggested that the optimal course of leaf development for annual plants is the attainment of a leaf-area of 30,000-40,000 square metres per hectare during a period of 50-60 days. If the course of leaf development can be brought to the optimal by improved cultivation methods, further increases in yield can only be obtained by increasing the rate and productivity of the photosynthetic system. In optimal conditions net assimilation rates of 10 grams of dry matter per square metre of leaf area per day can be obtained (*Fld. Crop Abstr.* 12: 870, 871).

143. *A new method for describing pasture in terms of height and density.* This method, which takes into account the distribution of herbage density throughout the height range of a sward, is based on measuring the proportion of a sward which attains a series of heights one inch apart. A special point-quadrat apparatus is used. The method has been used to follow the development of swards under different treatments and to provide an objective measurement of a sward in terms of height and density (*Herb. Abstr.* 28: 746).

144. *Legumes and Rhizobium symbiosis.* The study of host/rhizobium symbiosis in legumes has given rise to the hypothesis that the cowpea type of rhizobium associated with tropical leguminosae is the ancestral or typical condition and that the lime-demanding Trifolium type is a highly specialised development of the main type. The cowpea type of rhizobium does not demand lime and it is suggested, therefore, that it is amongst legumes of this class that one should look for pasture legumes suitable for the tropics where soils are usually lacking in calcium and lime is often expensive (*Herb. Abstr.* 27: 711).

With regard to those legumes which do need calcium for their proper development, promising results have been obtained in Australia by pelleting clover seed with lime so as to protect the Rhizobium inoculum on the seed from soil acidity, thus allowing nodulation of clover roots, even on acid soils.

Belgian experiments with soyabeans have shown that a specific strain of rhizobium was able to

colonize the plants' roots in a 16-hour day, but in an 8-hour day colonization was feeble. From this it has been concluded that the functioning of the leaves, as determined by day length, influences nodule formation and the effectiveness of a specific rhizobium—a new conception which may influence research on nodule formation, particularly in the tropics where days are short.

Work in the Belgian Congo indicates that great advantages are to be gained from inoculating field crops, such as groundnuts, with their appropriate rhizobium before sowing (Bonnier and Seeger).

145. *Studies in competition amongst pasture plants.* A recent Australian study of the development and fate of individual plants grown from seed of contrasting sizes in swards of subterranean clover, showed that plant numbers fell by about 30% during the course of the study and that in swards from large plus small seeds, only those plants from small seeds died. It was concluded that the disappearance of the plants from small seeds was due to shade from the plants derived from large seeds (*Herb. Abstr.* 28: 1613).

146. *Water relation studies.* A new conception of moisture losses from pastures has been revealed by recent work in New Zealand where it has been shown that in sunny weather the soil-moisture lost from short pastures is greater than from under long grass. It is postulated that in sunny conditions the relative losses of moisture from short and long pastures are controlled by leaf-temperature, that of the short pasture being about 10°C above air temperature, while that of the long pasture is seldom more than 1°C above air temperature. However, under low intensities of radiation the leaf temperatures of the two pasture types are approximately the same and the greater evaporating surface in the long pasture then becomes the predominant factor (*Herb. Abstr.* 28: 1618).

Recent experiments on water conservation in semi-arid tropical East Africa have shown that the sowing of teff grass, a quick-growing, short-season annual of shallow-rooting habit, offers a logical alternative to bare fallowing, a dangerous and inappropriate technique in the dry tropics. This grass not only provides efficient soil protection but suppresses weeds and preserves sub-soil moisture (*Fld. Crop Abstr.* 12: 457).

It is only within the last few years that the physical laws relevant to evaporation and transpiration have been clarified and applied to field problems, but even now they have not progressed beyond the stage of generalizations. However, it may be claimed that the use of the leaf area and evaporation rate as an index of crop-water requirement has been satisfactory in widely varying circumstances. Techniques for the direct estimation of water use in crops are now available. The information to be gained from using such techniques should prove invaluable, e.g. when patterns of rainfall expectation for cotton-growing areas in, say, Uganda become available, it will be possible to match the water-use pattern against the pattern of water supply and thereby to determine the sowing date that will give the best expectation of a good crop (*Fld. Crop Abstr.* 12: 844).

147. *Growth substances.* The re-discovered growth-promoting substance gibberellic acid has been tested in a multitude of experiments on a wide range of plants in the past three years. The ability of this remarkable substance to produce pronounced elongation of stem growth, to induce flowering, to break seed dormancy and to increase leaf area raises the hope that it will find numerous practical applications in plant science and production, e.g., the acceleration of seedling growth during the susceptible early stages, thus reducing the risk of fungal and insect attacks.

148. *Weeds and weed control.* Notable progress has been made in the development and use of new selective herbicides, e.g., the notorious water hyacinth which when uncontrolled rapidly blocks irrigation canals and other waterways in the tropics can now be controlled by spraying with herbicides such as 2, 4-D and 2, 4, 5-T. Another serious weed pest, couch grass, can now be controlled by dalapon and there are indications that a successful herbicide has at last been discovered for bracken.

Mechanical weed control. Trials carried out in the North of England go to show that rhizomatous weeds, such as couch or twitch, can be eradicated by rotary cultivation, provided that the grass roots are cut into short lengths during the process and that the soil is stirred at intervals by further cultivations. The procedure would seem to offer a promising line of attack on other troublesome weeds of both temperate and tropical regions.

Trapping. Recent French work suggests that the root-parasite *Orobanche ramosa* (broom-rape) can be "trapped", and thus controlled, by first sowing caraway, the roots of which stimulate the germination of Orobanche seeds and act as hosts, but do not allow the parasite to develop and set seed (*J. Agric. trop. et Bot. appl.* 1958, 5, 491-6).

149. *Extraction and utilization of leaf-protein.* The possibility of extracting from herbage leaf protein for human consumption has been discussed for some years. Machinery has now been designed to extract juice containing a considerable proportion of the proteins in herbage and from this a protein concentrate can be prepared. However, the extraction and utilization of the leaf protein as an important agricultural product is an undertaking for the future and is dependent on our ability to produce a

palatable product which is cheaper than alternative sources of protein of equivalent nutritive value (*Herb. Abstr.* 27, pp. 235-45).

150. *Mechanical grazing.* The highest theoretical utilization of herbage is possible when it is cut and carried to livestock throughout the growing season—as in the old laborious soilage system. Modern forage-harvester equipment, worked by one man, has revived interest in this cut-and-carry system, for which many advantages are claimed.

151. *Silage studies.* A new method for making silage under a plastic dome exhausted of air is claimed to have definite advantages.

Experiments with potato-top silage, made with added molasses, show promise and indicate a fresh source of fodder supply.

152. *Rice.* It has been shown in Swaziland that as an alternative to the ratooning system, which gives one good crop and one small one in a year, two good rice crops can be taken in two years from one preparation of the land and one sowing, the second crop ("spring ratoons") yielding little less than the first (*Fld. Crop Abstr.* 9: 770).

Broadling—a promising new technique in paddy cultivation—has been tested in Ceylon. In this, three-week-old seedlings are broadcast instead of being transplanted, thus reducing labour costs by two-thirds, and also the amount of seed needed (*Fld. Crop Abstr.* 10: 941).

Nitrogen-fixing blue-green algae (*Tolypothrix tenuis*) from Borneo have been used in numerous field experiments in Japan to inoculate rice fields. The results have shown considerably increased yields, equivalent to an application of about 64 lb. of sodium nitrate per acre (*Fld. Crop Abstr.* 10: 1371).

Infra-red rays. Trials in Italy indicate that it is economically possible to dry rice grain by infra-red rays. (*Fld. Crop Abstr.* 11: 1048).

153. *Seed testing.* A new method has been developed for determining the germinating energy of seeds, based on measuring the lifting-force exerted by seeds during germination (*Fld. Crop Abstr.* 11: 364).

154. *Longevity of seeds.* Seeds of agricultural plants, in sealed glass tubes dated 1832, found in the foundation stone of a wrecked Nuremburg building, were tested in 1955 when some of the oat and barley seeds proved to be viable. This spell of approximately 124 years is claimed to be a longevity record in cereals—the story of viable wheat being found in Egyptian pyramids is a myth (*Fld. Crop Abstr.* 11: 589).

155. *Mapping of vegetation.* Considerable progress has been made in surveying and mapping the world's vegetation, particularly in Africa where aerial-survey methods now allow comparatively rapid mapping. Vegetation maps covering large areas of Africa, south of the Sahara and several regions of the Belgian Congo have appeared recently and should serve as a basis for improved land utilization.

156. *The International Code of Nomenclature for Cultivated Plants.* Under this code, which takes effect from 1st January, 1959, the term strain as at present used for crop plants is discontinued and replaced by the term cultivar or variety (*Fld. Crop Abstr.* 11: 1240).

Plant Breeding and Genetics

157. In the Notes on Progress in the Annual Report for 1954-55 it was mentioned that the position of Lysenko in Soviet Genetics remained in the balance. Today the wheel seems to have turned full circle: in the four intervening years Lysenko has been subjected to increasing criticism in the *Botanical Journal* and other scientific periodicals in the Soviet Union (*Plant Breeding Abstracts* XXVIII, 1182, 2769, 3717, 4000, 4004, XXIX, 91, 754), though he continued to defend himself (*PBA* XXVIII, 3722-3). The Mendelian geneticists failed to appear at the 10th International Congress of Genetics, the issue of *Pravda* of 17th December, 1958 criticized the *Botanical Journal* for its unsympathetic attitude, and the first issue of the *Botanical Journal* for 1959 contains a completely revised list of members of the Editorial Board, from which Lysenko's critics seem to have been entirely removed; moreover it opens with a reproduction of the critical article in *Pravda* referred to above.

158. An unobtrusive movement which could result in a considerable change in experimental outlook in the future has been a reassessment of the rôle of statistics in plant breeding and related fields (*PBA* XXIV, 767, XXVI, 3 and XXVII, 2433). L. Hogben, in his recent and provocative book, Statistical Theory, has advanced a number of criticisms concerning the theoretical foundations of statistics. Setting these aside, it is still possible to argue, as S. C. Salmon does, that current statistical methods fall short in as far as they are more concerned with the accuracy of estimates of the error than with the precision of the mean values which are the principal interest of experimenters.

On the other hand an increasing use of electronic computers has been noted in researches on population genetics and evolutionary problems.

159. The induction of mutations as a method of breeding crop plants continues to attract attention. Work on these lines has continued intensively in Sweden, Germany and the U.S.A.; a number of other countries, including the Soviet Union, have started similar programmes, based usually on the use of gamma radiation from cobalt-60, either in

specially constructed greenhouses or in a so-called "gamma field" as at the Brookhaven National Laboratory in New York. Promising results claimed from the method include barleys with short straw that does not lodge, naked grain, improved yielding capacity or resistance to mildew (cf. *PBA* XXVIII, 1653); rust-resistant forms of wheat and oats; groundnuts resistant to *Cercospora* spp. and to *Sclerotium* (*Pellicularia*) *rolfsii*; early and late flowering peaches and many mutants in fruit trees induced by irradiating vegetative tissue (cf. *PBA* XXVIII, 922). Doubt has, however, recently been thrown on the validity of many of the reports of valuable mutants, since R. S. Caldecott in the U.S.A. has shown that irradiated cereals have a higher degree of male sterility and hence a greater propensity for out pollination than the normal forms; thus many of the so-called "mutants" may simply be the result of segregation. Doubts as to the advisability of using irradiation have been expressed also by Harland, who maintains that it may produce mutations to greater virulence in the pathogens of the irradiated plants.

160. A very promising application of irradiation has been found in its use to induce chromosome translocations in interspecific hybrids; by this means Sears has succeeded in transferring resistance to leaf rust from *Aegilops umbellulata* to common wheat without introducing any of the undesirable properties of the wild parent (cf. *PBA* XXVII, 372). The work of Sears in transferring single chromosomes from one species to another has had some very interesting developments and is being widely adopted in Canada and elsewhere in both theoretical and practical studies. A complete series of so-called nullisomics has been built up by Sears in the wheat Chinese Spring, each line having a different one of the 21 chromosomes missing; these are being crossed with agriculturally interesting wheats at centres like the Universities of Alberta and Winnipeg and in this way it is proving possible to locate agronomically interesting characters such as disease resistance, yield and quality on the individual chormosomes or even parts of them (cf. *PBA* XXIX, 41).

161. Substitutions of rye chromosomes into wheat varieties have been made at Cambridge by Riley; in this work and in studies by Sears in the U.S.A. it has been shown that one of the chromosomes in hexaploid wheat apparently carries a gene that suppresses pairing between homologous chromosomes; when this gene is absent pairing is more frequent and the chances of introducing genic material from rye and other genera seem to be increased (*PBA* XXIX, 1083, 1098 and 1381). Moreover, in experiments in Canada using material deficient in this gene, true homology has been demonstrated between some chromosomes of rye and *Aegilops squarrosa*, which is thought to be one of the ancestors of the bread wheats. This view of the origin of bread wheat has been put forward by Kihara (cf. *PBA* XXVII, 420) and supported by other workers in Japan, Canada and elsewhere, some of whom have been able to recreate the bread wheat artificially by crossing the putative parents. Workers at Winnipeg in Canada are now going one step further in the attempt to create a parallel form based on rye in place of *Ae. squarrosa*, the indications being that this series is going to be better in yield and other properties than the original bread wheats.

Much value is claimed also for new wheat species created in the U.S.S.R. by Cicin and others, by crossing wheat or rye with wild grasses such as *Agropyron* and *Elymus*. Some of the common wheats that have resulted are claimed to be stronger in the straw than any wheat yet known and to give unusually high yields in northerly areas, including Latvia and Siberia. The so-called perennial wheats produced from these same crosses are still said to be best when sown annually and used to give an initial crop of grain followed by one or more crops of hay.

162. Another line of approach to crop improvement being widely adopted in the U.S.A. and Canada is the use of isogenic lines, i.e. lines of a well-known agricultural plant such as Prelude wheat identical in all characters but one, say disease resistance. A whole series of such lines is being built up in the high-quality wheat Thatcher at Winnipeg, each line carrying a different gene for rust resistance.

163. A combination of these various lines of approach may provide the solution for the problem of disease control. But again it may not. The problem as it concerns wheat rust seemed to be solved once for all in 1949, but the epidemic appearance in 1950 of the dreaded race 15B of stem rust in N. America changed the situation almost overnight. This situation has been paralleled in oat rust, late blight of potatoes, black arm of cotton and many other pathogens and in a recent review of the question E.C. Stakman (cf. *PBA* XXIX, 2114) goes so far as to admit that too much reliance has so far been placed on specific resistance to a given group of biotypes and not enough to alternative forms of resistance. One of these alternatives is the type of generalized resistance such as adult-plant resistance in cereals and impeded germination in potato blight. Another is the use of mixed populations containing a range of genes providing resistance to a number of different groups of races, the composition of the population being varied as circumstances require. This approach is apparently meeting with success in Mexico, Peru and Colombia (cf. *PBA*, XXVII, 1374, XXVIII, 2791).

164. The use of hybrids continues to extend. It has been reported that in the seventeen countries

participating in the joint scheme for hybrid maize in Europe the acreage has doubled in three years and the increase in production has been estimated at over one and a half million tons. Hybrid sorghums are being distributed widely in the U.S.A. and are giving increases varying from 10% to 60% in yield of grain (cf. *PBA* XXVII, 1805-8). Some of these hybrids have been produced by the use of cytoplasmically male-sterile lines, a technique that is being adopted also in breeding hybrid maize, sugar beet and other crops. In Japan it is stated that in future the breeding of all the main vegetables will be carried out on the system of F_1 hybrid seed (cf. *PBA* XXVII, 4302); a Japanese hybrid Brussels sprout produced by Takii has been awarded a prize in the U.S.A. and released for sale there at the beginning of 1959 (cf. *PBA* XXVIII, 4778).

165. Artificial induction of polyploidy continues to receive attention and successes from this method claimed in Sweden include improved forms of clover, dill, turnip, rye and apple, the tetraploid Sirius turnip being quoted as an outstanding example of what may be achieved in this field. Sugar-beet breeders in a number of countries are making use of a method designed by A. Graf in Austria for the rapid determination of chromosome number in beets after treatment with colchicine, by which means the time and labour expended in detecting the polyploids is materially reduced.

166. The gradual conversion of sugar-beet to the monogerm habit continues apace in the U.S.A. and, possibly less rapidly, in the U.S.S.R. (cf. *PBA* XXVIII, 781-2), and elsewhere. Autumn sowing of sugar beet in specially favoured areas like southern Italy is extending and here again the best results are being given by polyploid varieties (cf. *PBA* XXIX, 546).

167. The use of haploids for breeding purposes is extending in the U.S.A. In maize, by selfing the partially fertile individuals occasionally found among haploids, several hundred homozygous diploid progenies have been developed. In tests of these as parents of the commercial type of hybrids, a high percentage have given an outstandingly good performance (*PBA* XXIX, 958). An intensive programme based on the use of haploids in Potato breeding has been started at the University of Wisconsin. Crosses between haploids of the domestic potato and several wild potato species have been successful, a new approach for the transfer of desirable genes to the cultivated potato thus being made possible (*PBA* XXVIII, 4377-8).

168. Potatoes resistant to the potato eelworm (*Heterodera rostochiensis*) were found for the first time in representatives of the S. American species *Solanum andigenum* in the Commonwealth Potato Collection and are being used by potato breeders in the Netherlands, Germany, U.S.A. and elsewhere. Although "aggressive" races of the eelworm, capable of attacking these resistant forms, have been discovered in various places, the wild species *S. vernei* seems to maintain its resistance (cf. *PBA* XXVII, 3765, XXIX, 1738). This species is considered to be one of the possible ancestors of *S. andigenum* (cf. *PBA* XXV, 1179).

Extensive work on the physiological basis of the hypersensitive reaction of potato varieties to blight has been carried out in Hokkaido, Japan. The hypersensitive reaction appears to depend on oxidative phosphorylation.

169. Further advances have been made in breeding "sweet" lupins, i.e. forms free from the lupin alkaloids that make bitter lupins largely unsuitable for feeding to livestock, in a number of countries, notably Germany, the U.S.S.R. and Poland. A detailed genetic study of *Lupinus luteus* and *L. angustifolius* shows that, as the result of breeding work, largely in Germany, an entirely new secondary gene centre has arisen in these species in the course of this century. A promising short form of *L. albus*, distinguished by early maturity, has arisen by the mutation of a single gene. Forms with neutral reaction to both day length and temperature are being bred as they are less sensitive to unfavourable environmental conditions (cf. *PBA* XXVII, 312-5). Much light has been shed on the specific interrelationships of lupin species by studies of the alkaloids by paper chromatography carried out both in Germany (cf. *PBA* XXVIII, 1787) and in Poland.

170. In the realm of purely theoretical considerations concern has been expressed that the landing of missiles on the moon may seriously reduce the scientific value of the moon's surface. It is pointed out that if the moon's cosmic dust remains uncontaminated it will furnish valuable information in elucidating the problem of prebiotic organic synthesis (*PBA* XXIX, 105).

FINANCE

171. The Comptroller and Auditor General has audited the account of the Institute of Entomology, the Mycological Institute and the Bureaux for 1958-59 and the accounts of the Institute of Biological Control for 1956-57 and 1957-58. These accounts are attached to this report. The position as regards contributions on 31st March, 1959, was as follows:

(1)	Contributions due in 1958–59 (2)	Outstanding on 31.3.58 (3)	Total due (4)	Outstanding on 31.3.59 (5)	Total received in 1958–59 (6)
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Institute of Entomology	47,475 0 0	416 4 0	47,891 4 0	258 5 0	47,632 19 0
Mycological Institute	41,778 0 0	366 0 0	42,144 0 0	226 16 0	41,917 4 0
Bureaux	163,314 0 0	3,614 13 0	166,928 13 0	886 2 4	166,042 10 8

NOTES:

(i) The figures in column (2) are those recommended by the Review Conference 1955 (page 48 of the report).

(ii) The figure of receipts in column (6) in respect of the Bureaux agrees with the amount shown in the audited account on page 39. The figures in the audited accounts on pages 40 and 41 for Entomology and Mycology are less than the amounts shown in column (6) by £5 6*s.* 0*d.* and £4 13*s.* 0*d.* respectively. The amounts were received from the Colonial Territories during 1958-59 but were not credited to the Institutes until after the close of the financial year.

(iii) An amount of £6,028 13*s.* 5*d.*, reported in note (iii) on page 38 of the 24th Annual Report, is still outstanding.

(iv) An amount of £915 5*s.* 0*d.* reported in note (iii) on page 36 of the 29th Annual Report is still outstanding.

(v) Since the close of the year, the outstandings in column (5) have all been paid.

172. *Commonwealth Institute of Biological Control.* The audited accounts for the Institute of Biological Control attached to this report relate to the years 1956-57 and 1957-58. The position as regards contributions from governments at 31st March, 1957, was as follows:

	£	s.	d.
Amount due in respect of 1956-57 ..	25,320	0	0
Add arrears outstanding on 31st March, 1956	31	16	0
Amount expected during the year 1956-57	25,351	16	0
Deduct arrears outstanding on 31st March, 1957	79	13	0
Contributions received during the year	£25,272	3	0

173. The position as regards contributions from governments at 31st March, 1958 was as follows:

	£	s.	d.
Amount due in respect of 1957-58 ..	43,044	0	0
Add arrears outstanding on 31st March, 1957	39	18	0
Amount expected during the year 1957-58	43,083	18	0
Deduct arrears outstanding on 31st March, 1958	377	3	0
Contributions received during the year	£42,706	15	0

The outstanding amounts on 31st March, 1958, have all been paid.

Notes:

(i) An amount of £668 8*s.* 2*d.* reported in note (ii) on page 45 of the 25th Annual Report is still outstanding.

(ii) The figure of arrears outstanding on 31st March, 1957, does not agree with the figure shown in the table for the year 1956-57. An amount of £39 15*s.* has been taken out and will be recorded as a note under "finance" in each succeeding Annual Report like the sum under note (i) above.

174. *Bureaux Fund.* The total expenditure divided between the Bureaux, Secretariat and Central Sales Branch is given below:

Commonwealth Bureaux:	£	s.	d.
Animal Breeding and Genetics (Edinburgh)	18,381	8	4
Animal Health (Weybridge)	20,485	6	4
Animal Nutrition (Aberdeen)	14,376	6	0
Dairy Science and Technology (Shinfield)	14,178	2	6
Forestry (Oxford)	19,041	11	4
Helminthology (St. Albans)	12,854	0	0
Horticulture and Plantation Crops (East Malling)	19,235	16	0
Pastures and Field Crops (Hurley) ..	19,559	19	3
Plant Breeding and Genetics (Cambridge)	16,503	13	5
Soils (Rothamsted)	15,224	4	10
Secretariat	15,705	19	0
Central Sales Branch	12,742	6	5
Contributions to National Institute of Agricultural Engineering (Silsoe) ..	3,000	0	0
	£201,288	13	5

THE EXECUTIVE COUNCIL OF THE COMMONWEALTH AGRICULTURAL BUREAUX

Account of Receipts and Payments for the Year ended 31st March, 1959

RECEIPTS

	£ s. d.	£ s. d.
Contributions from Commonwealth and other participating Governments for:		
Commonwealth Agricultural Bureaux ..	166,042 10 8	
Various Institutes	125,850 16 0	
	291,893 6 8	
Less: paid over to Institutes	125,850 16 0	
		166,042 10 8
Sale of publications		47,005 5 8
Reprinting for Institutes, etc.		1,740 16 0
Contributions from Institutes towards cost of Headquarters		3,000 0 0
Miscellaneous receipts:		
Dividends and Interest	6,170 14 9	
Other receipts	154 18 0	
		6,325 12 9
		224,114 5 1
Repayment of Loan:		
Buckingham County Council		15,000 0 0
Redemption of securities:		
£88,000 Conversion Loan 4% Stock, 1957-58		88,000 0 0
Balance at 1st April, 1958		19,828 2 11
		£346,942 8 0

PAYMENTS

	£ s. d.	£ s. d.
Secretary's and Assistant Secretary's Salaries ..		4,104 3 0
Consultant Directors' honoraria		945 0 0
Directors' and Assistant Directors' Salaries ..		37,397 15 7
Scientific Assistants' Salaries		48,318 9 10
Clerical and Technical Staff		39,019 2 7
National Insurance		2,760 9 2
Superannuation		11,806 14 10
Supplementation of Superannuation and increases in pensions		624 19 11
Travelling expenses		1,709 7 1
Books, periodicals, etc.		1,761 9 7
Issue bulletins and periodical publications ..		33,182 6 1
Stationery, postage, telephones, etc.		6,613 14 4
Rent, Maintenance, etc.		5,411 4 8
Contribution to National Institute of Agricultural Engineering		3,000 0 0
Accounting charges and Audit Fee		2,060 0 0
Miscellaneous Expenses		784 5 10
Furniture and equipment		1,034 13 1
Visits Overseas (outside Europe)		754 17 10
		201,288 13 5
Loans:		
Cheshire County Council	50,000 0 0	
Slough Borough Council	52,000 0 0	
		102,000 0 0
Balances at 31st March, 1959:		
H.M. Paymaster General	26,316 16 5	
Post Office Savings Bank	4,580 0 3	
Treasury Bills—at cost	9,922 10 0	
Sub-accountants and suspense	2,834 7 11	
		43,653 14 7
		£346,942 8 0

Investments at 31st March, 1959:

£		*Cost* £ s. d.	*Market value at 31st March, 1959* £ s. d.
2,000	Commonwealth of Australia 4% Stock, 1955-70	1,940 4 0	1,770 0 0
	Cheshire County Council loans:		
25,000	to 25th April, 1960 at 6%	25,000 0 0	25,000 0 0
25,000	to 4th June, 1960 at 5¾%	25,000 0 0	25,000 0 0
	Slough Borough Council loans:		
17,000	to 23rd September, 1960 at 5½% ..	17,000 0 0	17,000 0 0
15,000	to 27th January, 1961 at 5½%	15,000 0 0	15,000 0 0
20,000	to 18th March, 1961 at 5¼%	20,000 0 0	20,000 0 0
		£103,940 4 0	£103,770 0 0

(Signed) G. G. HEWLETT,
Accountant to Council.

(Signed) S. HOWARD, Secretary,
Executive Council, Commonwealth
Agricultural Bureaux.

I have examined the above Account. I have obtained all the information and explanations that I have required, and I certify, as the result of my audit, that in my opinion the above account is correct.

Exchequer and Audit Department,
30th July, 1959.

(Signed) E. G. COMPTON,
Comptroller and Auditor-General.

COMMONWEALTH INSTITUTE OF ENTOMOLOGY

Account of Receipts and Payments for the Year ended 31st March, 1959

RECEIPTS

	£ s. d.	£ s. d.
Contributions:		
Commonwealth and other participating Governments	47,627 13 0	
Other contributors ..	500 0 0	
		48,127 13 0
Sale of publications		14,629 12 0
Dividends and interest ..		1,245 15 9
Administration Fees and Agency charges:		
Pool of Entomologists ..	200 0 0	
Termite Research Unit ..	75 0 0	
African Phyto-sanitary Commission	1,549 14 11	
		1,824 14 11
		65,827 15 8
Balance at 1st April, 1958 ..		12,563 3 9
		£78,390 19 5

PAYMENTS

	£ s. d.	£ s. d.
Directors' salaries		4,564 0 8
Scientific Assistants' salaries		26,268 16 5
Clerical and Technical staff		8,361 4 4
National Insurance		761 17 8
Superannuation		3,304 18 5
Supplementation of superannuation and increases in pensions		812 14 10
Travelling expenses		3 16 0
Books, periodicals, etc.		385 16 7
Issue bulletins and periodical publications		7,786 3 11
Stationery, postage, telephones, etc.		936 18 2
Rent, rates, insurance, maintenance, etc.		581 13 8
Lighting, heating, water, cleaning, etc.		552 10 3
Contribution to Headquarters, accounting charges and audit fee		1,408 17 4
Miscellaneous Expenses		200 5 4
Furniture and Equipment		373 11 1
		56,303 4 8
Purchase of freehold of No. 56, Queen's Gate, London, S.W.7		4,750 0 0
Balances at 31st March, 1959:		
Crown Agents for Oversea Governments and Administrations	356 7 3	
Bank, petty cash and stamps	13 6 10	
Joint Consolidated Fund	16,000 0 0	
F.S.S.U. and miscellaneous suspense	968 0 8	
		17,337 14 9
		£78,390 19 5

Investments at 31st March, 1959:

£ s. d.		Cost £ s. d.	*Market value at 31st March, 1959* £ s. d.
1,000 0 0	Cyprus 4% Stock, 1956/66	950 0 0	825 0 0
2,679 19 0	Funding Loan 4% Stock, 1960/90 ..	1,869 12 6	2,438 15 1
1,017 16 8	Kenya 4½% Stock, 1961/71	998 15 0	865 3 2
1,000 0 0	Nigeria 4% Stock, 1963	881 7 0	920 0 0
951 1 10	Savings 3% Bonds, 1960/70	1,040 5 2	775 2 10
3,000 0 0	N. Rhodesia 3% Stock, 1963/65	2,911 1 7	2,475 0 0
2,000 0 0	War Loan 3% Stock, 1955/59	2,035 0 0	2,010 0 0
2,060 17 1	Savings 3% Bonds, 1955 65	2,126 15 1	1,906 5 10
1,013 18 2	Nyasaland 4½% Stock, 1971/78	1,000 13 3	800 19 9
		£13,813 9 7	£13,016 6 8

(Signed) G. G. HEWLETT,
Accountant to Council.

(Signed) E. O. PEARSON,
Director.

I have examined the above Account, I have obtained all the information and explanations that I have required, and I certify, as the result of my audit, that in my opinion the above account is correct.

(Signed) E. G. COMPTON,
Comptroller and Auditor-General.

Exchequer and Audit Department,
28th July, 1959.

(Signed) S. HOWARD, Secretary,
Executive Council,
Commonwealth Agricultural Bureaux.

COMMONWEALTH MYCOLOGICAL INSTITUTE

Account of Receipts and Payments for the Year ended 31st March, 1959

RECEIPTS

	£ s. d.	£ s. d.
Contributions:		
Commonwealth and other participating Governments	41,912 11 0	
Other contributors ..	2,649 14 2	
		44,562 5 2
Sale of publications		11,470 12 2
Sale of Cultures		717 3 3
Rent of acquired property ..		848 14 11
Dividends and Interest ..		1,607 18 2
Administration Fees and Agency charges:		
Pool of Plant Pathologists	844 12 4	
African Phyto-sanitary Commission (part payment)	814 10 9	
		1,659 3 1
		60,865 16 9
Instalment of contribution towards cost of building completed in 1955 ..		51 0 0
Sale of investment:		
£10,000 Conversion Loan 4% Stock 1957-58 ..		9,996 5 0
Balance at 1st April, 1958 ..		18,779 2 6
		£89,692 4 3

PAYMENTS

	£ s. d.	£ s. d.
Director's Salary		2,486 5 0
Scientific Assistants' Salaries		21,613 12 8
Clerical and Technical staff		10,990 14 2
National Insurance		778 0 4
Superannuation		3,236 12 4
Supplementation of Superannuation and Increases in pensions		315 3 6
Travelling expenses		158 6 1
Books, periodicals, etc.		382 14 10
Issue bulletins and periodical publications		7,445 4 3
Stationery, postage, telephones, etc.		802 12 4
Rent, rates, insurance, maintenance, etc.		2,238 17 9
Lighting, heating, water, cleaning, etc.		2,377 15 2
Contribution to Headquarters, accounting charges and audit fee		1,343 11 7
Miscellaneous expenses		209 18 6
Furniture and equipment		1,965 13 7
		56,345 2 1
Balances at 31st March, 1959:		
Crown Agents for Oversea Governments and Administrations	744 8 8	
Petty cash and stamps	8 5 11	
Joint Consolidated Fund	31,966 13 3	
F.S.S.U. and Miscellaneous Suspense	912 5 2	
	33,631 13 0	
Less: Bank overdraft	284 10 10	
		33,347 2 2
		£89,692 4 3

Investments at 31st March, 1959:	*Cost* £ s. d.	*Market value at 31st March, 1959* £ s. d.
£2,077 15s. 4d. New Zealand 3½% Stock, 1960/64	2,077 15 4	1,973 17 7

(Signed) G. G. HEWLETT,
Accountant to Council.

I have examined the above Account. I have obtained all the information and explanations that I have required, and I certify, as the result of my audit, that in my opinion the above account is correct.

(Signed) E. G. COMPTON,
Comptroller and Auditor-General.

Exchequer and Audit Department.
30th July, 1959.

(Signed) J. C. HOPKINS,
Director.

(Signed) S. HOWARD, Secretary,
Executive Council,
Commonwealth Agricultural Bureaux.

COMMONWEALTH INSTITUTE OF BIOLOGICAL CONTROL

Account of Receipts and Payments for the Year ended 31st March, 1957

RECEIPTS	Canada $ c.	Canada £ s. d.	United Kingdom £ s. d.	Total £ s. d.
Contributions from Commonwealth and other Governments	11,440.00	4,160 0 0	21,112 3 0	25,272 3 0
Sale of publications ..	370.88	135 0 10	136 1 8	271 2 6
Interest:				
General account ..			248 4 10	248 4 10
Capital account ..			279 12 4	279 12 4
Income from levy on special projects:				
(*a*) Overheads $4,454.70				
(*b*) Use of official cars $1,583.85	6,038.55	2,198 14 3		2,198 14 3
	17,849.43	6,493 15 1	21,776 1 10	28,269 16 11
Remittances from the United Kingdom ..	45,883.75	17,000 0 0		17,000 0 0
Exchange difference on revaluation of dollar balances at 31st March, 1957		442 7 5		442 7 5
Special projects:				
Receipts from sponsors $45,791.13				
Less: allocated above $6,038.55				

PAYMENTS	Canada $ c.	Canada £ s. d.	United Kingdom £ s. d.	Total £ s. d.
Directors' Salaries	16,055.00	5,845 16 8	307 13 6	6,153 10 2
Superannuation			594 19 1	594 19 1
Entomologists' Salaries ..	32,012.53	11,656 3 7	686 14 4	12,342 17 11
Superannuation			1,160 15 2	1,160 15 2
Clerical and Technical Staff Salaries	8,988.00	3,272 13 0	146 7 0	3,419 0 0
Superannuation			319 14 5	319 14 5
Part-time Scientific ..	127.38	46 7 7		46 7 7
Part-time Clerical	941.81	342 18 6		342 18 6
Travelling Expenses ..	3,373.51	1,228 6 9		1,228 6 9
Official cars: running expenses	3,283.03	1,195 7 11		1,195 7 11
Books, periodicals, etc. ..	449.05	163 10 1	4 18 0	168 8 1
Issue bulletins and periodical publications	59.50	21 13 4	39 14 1	61 7 5
Freight and Postage ..	1,092.25	397 14 0		397 14 0
Rent, Maintenance, etc.:				
Headquarters, Ottawa ..	251.60	91 12 3		91 12 3
Field Stations	6,210.22	2,261 4 5		2,261 4 5
Contribution to Headquarters, audit fee and contingencies	113.29	41 5 0	740 0 0	781 5 0
Furniture and Equipment ..	45.34	16 10 2		16 10 2
	73,002.51	26,581 3 3	4,000 15 7	30,581 18 10
Remittances to Canada ..			17,000 0 0	17,000 0 0
Expenditure on special pro-				

Balance at 1st April, 1956	41,203.03	14,715	7	4	3,631	5	6	18,346	12	10	
Balances at 31st March, 1957:											
United Kingdom:		£	s.	d.							
Crown Agents for Overseas Governments and Administrations		454	9	6							
Joint Consolidated Fund		2,000	0	0							
Post Office Savings Bank (capital account)		2,860	6	2							
F.S.S.U. Suspense		9	1	1							
		5,323	16	9							
Less Miscellaneous Suspense ...		917	5	0							
								4,406	11	9	4,406 11 9
Canada:		$	c.								
Sundry Imprests		10,329.84									
Treasury		29,999.67									
								40,329.51	15,127	7	0 15,127 7 0
	$144,688.79	£53,125	18	6	£25,407	7	4				£78,533 5 10

(Signed) G. G. HEWLETT,
Accountant to Council.

(Signed) F. J. SIMMONDS,
Director.

I have examined the above Account. I have obtained all the information and explanations that I have required, and I certify, as the result of my audit, that in my opinion the above account is correct.

(Signed) E. G. COMPTON,
Comptroller and Auditor-General.

Exchequer and Audit Department,
14th May, 1959.

Investments at 31st March, 1957:

	Cost	*Market value at 31st March, 1957*
£5,000 Exchequer 5% Stock 1957 ..	£5,000	£5,025

NOTE: The closing balance in Canada shown above includes an unexpended balance of $10,480.38 advances received from sponsors of special projects: expenditure on other projects not yet recovered amounts to $5,809.00.

(Signed) S. HOWARD, Secretary, Executive Council,
Commonwealth Agricultural Bureaux.

COMMONWEALTH INSTITUTE OF BIOLOGICAL CONTROL

Account of Receipts and Payments for the Year ended 31st March, 1958

RECEIPTS	Canada		United Kingdom	Total
	$ c.	£ s. d.	£ s. d.	£ s. d.
Contributions from Commonwealth and other Governments	19,530.51	7,072 0 0	35,634 15 0	42,706 15 0
Sale of publications	406.79	151 9 0	34 17 8	186 6 8
Interest:				
General account			484 14 7	484 14 7
Capital account			309 0 0	309 0 0
Income from levey on special projects:				
(*a*) Overheads $3,653.18				
(*b*) Use of official cars $2,191.17	5,844.35	2,175 17 2		2,175 17 2
Miscellaneous receipts	472.43	175 17 9		175 17 9
Recovery of F.S.S.U. contributions from Officer on unpaid leave	227.75	84 15 10		84 15 10
	26,481.83	9,659 19 9	36,463 7 3	46,123 7 0
Remittances from the United Kingdom	53,468.75	20,000 0 0		20,000 0 0
Special projects:				
Receipts from sponsors $28,253.40				
Less: allocated above $5,844.35	22,409.05	8,342 18 2		8,342 18 2
Redemption of Securities:				
£5,000 Exchequer 5% Stock 1957			5,000 0 0	5,000 0 0

PAYMENTS	Canada		United Kingdom	Total
	$ c.	£ s. d.	£ s. d.	£ s. d.
Directors' Salaries	16,055.00	5,977 5 10	313 14 6	6,291 0 4
Superannuation			594 19 1	594 19 1
Entomologists' Salaries	33,588.25	12,504 18 8	708 14 10	13,213 13 6
Superannuation			1,548 8 10	1,548 8 10
Clerical and Technical Staff Salaries	8,493.00	3,161 19 0	166 1 8	3,328 0 8
Superannuation			312 1 3	312 1 3
Part-time Scientific	2,966.94	1,104 11 11		1,104 11 11
Part-time clerical	4,374.88	1,628 15 5		1,628 15 5
Travelling expenses	554.24	206 6 11	45 12 8	251 19 7
Official cars: running expenses	3,378.17	1,257 13 11		1,257 13 11
Books, periodicals, etc.	651.56	242 11 6	1 15 0	244 6 6
Issue bulletins and periodical publications	1,570.98	584 17 7	10 0 8	594 18 3
Freight and Postage	2,179.87	811 11 4		811 11 4
Rent, Maintenance, etc.:				
Headquarters, Ottawa	166.50	61 19 9		61 19 9
Field Stations	8,547.33	3,182 3 7		3,182 3 7
Contribution to Headquarters, audit fee and contingencies			1,145 4 2	1,145 4 2
Furniture and Equipment	6,069.65	2,259 14 9		2,259 14 9
	88,596.37	32,984 10 2	4,846 12 8	37,831 2 10
Remittances to Canada			20,000 0 0	20,000 0 0
Exchange difference on revaluation of dollar balances at 31st March, 1958		207 11 8		207 11 8
Expenditure on special projects	28,597.83	10,646 19 11		10,646 19 11
Purchase of Securities:				
£7,000 Conversion Loan 4% Stock, 1957-58 (including £2 6*s.* accrued interest)			6,973 19 11	6,973 19 11

Balance at 1st April, 1957	40,329.51	15,127	7	0	4,406	11	9	19,533	18	9						
Balances at 31st March, 1958:																
United Kingdom:		£	s.	d.												
Crown Agents for Oversea Governments and Administrations		823	16	9												
Joint Consolidated Fund		12,000	0	0												
Post Office Savings Bank (capital account)		1,195	6	3												
F.S.S.U. Suspense		28	13	5												
Miscellaneous Suspence		1	10	0												
													14,049	6	5	14,049 6 5
Canada:		$	c.													
Sundry Imprests		5,511.26														
Treasury		16,395.18														
Miscellaneous Suspense		3,588.50														
		25,494.94			9,291	3	2									9,291 3 2
	$142,689.14	£53,130	4	11	£45,869	19	0	£99,000	3	11	$142,689.14	£53,130	4	11	£45,869	19 0 £99,000 3 11

(Signed) G. G. HEWLETT,
Accountant to Council.

(Signed) F. J. SIMMONDS,
Director.

I have examined the above account. I have obtained all the information and explanations that I have required, and I certify, as the result of my audit, that in my opinion the above account is correct.

(Signed) E. G. COMPTON,
Comptroller and Auditor-General.

Exchequer and Audit Department,
13th July, 1959.

Investments at 31st March, 1958:	*Cost*	*Market value at 31st March, 1958*
£7,000 Conversion Loan 4% Stock, 1957-58	£6,973 19*s.* 11*d.*	£6,965

NOTE: The closing balance in Canada shown above includes an unexpended balance of $4,368.14 of advances received from sponsors of special projects: expenditure on other projects not yet recovered amounts to $5,727.86. Net expenditure of $157.68 has been written off as unrecoverable.

(Signed) S. HOWARD, Secretary, Executive Council,
Commonwealth Agricultural Bureaux.

LIST OF SANCTIONED STAFF, BY GRADES

TEN BUREAUX, HEADQUARTERS AND CENTRAL SALES

Secretary	*Assistant Secretary*	*Directors*	*Assistant Directors*	*Scientific Assistants*	*Executive Assistants*	*Indexers*	*Senior Clerical*	*Clerical and Typing*
1 (1)	1 (1)	10 (10)	10 (10)	55 (55)	3 (—)	6¼ (9)	11 (15)	60 (60)

INSTITUTES

	Director	*Assistant Director*	*Scientists*		*Executive Assistant*	*Preparators, etc.*		
			A/B	*C*		*D*	*E*	*F/Clerical and Typing*
Entomology	1 (1)	1 (1)	13 (15)	11 (13)	—	7 (9)	3 (3)	7 (7)
Mycology	1 (1)	—	11 (13½)	8 (10)	1 (—)	2 (1)	8 (10)	14 (19)

	Director	*Assistant Director*	*Senior Entomologist*	*Scientists*			*Librarian*	*Clerical and Typing*
				A	*B*	*C*		
Biological Control ..	1 (1)	1 (1)	1 (1)	1 (5)	1 (2)	7 (5)	1 (1)	10 (3)

Figures in brackets are those recommended by the 1955 Review Conference, see page 50 of the Report. This staff was not necessarily to be worked up to at the beginning of the quinquennium.

Consultant Directors are not included.

COMMONWEALTH AGRICULTURAL BUREAUX LIAISON OFFICERS

UNITED KINGDOM	W. Ness, Agricultural Research Council, Cunard Building, 15 Regent Street, London, S.W.1
CANADA	H. L. Trueman, B.S.A., Foreign Agricultural Relations Officer, Department of Agriculture, Ottawa, Ontario, Canada
AUSTRALIA	W. Ives, M.Ec., Commonwealth Scientific and Industrial Research Organisation, 314 Albert Street, East Melbourne, C.2, Victoria, Australia
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PAKISTAN	Tashkhir Ahmad, Ph.D. (Cantab.), Director, Department of Plant Protection, Government of Pakistan, Karachi
CEYLON	R. W. Wikramanayake, C.C.S., Assistant Secretary to Government, Ministry of Agriculture and Food, Colombo, Ceylon
GHANA	Permanent Secretary, Ministry of Agriculture, Ministry Buildings, Accra, Ghana
FEDERATION OF MALAYA	Secretary to the Ministry of Agriculture, Federation of Malaya, Swettenham Road, Kuala Lumpur, Malaya
FEDERATION OF RHODESIA AND NYASALAND	G. R. Bates, Ph.D. (London) Chief Botanist and Plant Pathologist, Department of Research and Specialist Services, P.O. Box 8100, Causeway, Southern Rhodesia
COLONIAL TERRITORIES	G. W. Nye, C.M.G., O.B.E., B.Sc. (Agr.), C.D.A., Agricultural Adviser to the Secretary of State, Colonial Office, Sanctuary Buildings, Gt. Smith Street, London, S.W.1
REPUBLIC OF THE SUDAN	Chief, Agricultural Research Division, Ministry of Agriculture, Wad Medani, Republic of the Sudan
REPUBLIC OF IRELAND	M. O'Doherty, Department of Agriculture (Economic Division), Dublin

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Cromwell Road, London, S.W.7

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56 Queen's Gate, London, S.W.7
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Commonwealth Institute of Biological Control,
Science Building, Carling Avenue,
Ottawa, Ontario, Canada
Director—F. J. Simmonds, Ph.D.

THE COMMONWEALTH AGRICULTURAL BUREAUX

Commonwealth Bureau of	Consultant Director	Director
Animal Breeding and Genetics— Institute of Animal Genetics, University of Edinburgh, King's Buildings, West Mains Road, Edinburgh, Scotland Tel.: Edinburgh 41535	Prof. C. H. Waddington, C.B.E., Sc.D., F.R.S.	J. P. Maule, M.A., Dip. Agric. (Cantab.), A.I.C.T.A., F.R.S.E.
Animal Health— Central Veterinary Laboratory, New Haw, Weybridge, Surrey Tel.: Byfleet 2826	A. W. Stableforth, D.Sc., M.R.C.V.S., D.V.S.M.	M. Crawford, M.R.C.V.S.
Animal Nutrition— Rowett Research Institute, Bucksburn, Aberdeen, Scotland Tel.: Bucksburn 162	D. P. Cuthbertson, C.B.E., M.D., D.Sc., F.R.S.E.	I. Leitch, O.B.E., M.A., D.Sc.
Dairy Science and Technology— National Institute for Research in Dairying, Shinfield, Reading Tel.: Reading 83103	A. T. R. Mattick, B.Sc., Ph.D.	E. J. Mann, N.D.D., C.D.D.
Forestry— Imperial Forestry Institute, Oxford Tel.: Oxford 57185	Prof. Sir Harry Champion, C.I.E., D.Sc., M.A.	F. C. Ford Robertson, O.B.E., M.A., B.Sc.
Helminthology— The White House, 103 St. Peter's Street, St. Albans, Herts. Tel.: St. Albans 52126	(Vacant)	J. M. Watson, D.Sc. (Lond.), A.R.C.S.
Horticulture and Plantation Crops— East Malling Research Station, East Malling, Kent Tel.: West Malling 3033	F. R. Tubbs, M.Sc., Ph.D., A.R.C.S., D.I.C., F.L.S.	D. Akenhead, O.B.E., M.A., B.Sc.
Pastures and Field Crops— Hurley, nr. Maidenhead, Berks. Tel.: Hurley 366	Willam Davies, D.Sc.	A. G. G. Hill, B.A., Agr.B., B.Sc.
Plant Breeding and Genetics— School of Agriculture, Cambridge Tel.: Cambridge 58381, Ext. 33	Professor Sir Joseph B. Hutchinson, C.M.G., Sc.D., F.R.S.	P. S. Hudson, O.B.E., Ph.D.
Soils— Rothamsted Experimental Station, Harpenden, Herts. Tel.: Harpenden 4671	F. C. Bawden, M.A., F.R.S.	G. V. Jacks, M.A.

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